THE ILLUMINATING ENGINEER

LIGHT
LAMPS
FITTINGS
AND
ILLUMINATION

THE JOURNAL OF

# GOOD LIGHTING

Official Organ of the Illuminating Engineering Society

FOUNDED IN LONDON 1908

Edited by
LEON GASTER

. OIL .
GAS
ELECTRICITY
ACETYLENE
PETROL-AIR
GAS
ETC.

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## Special Features:

Progress in Illuminating Engineering—New Lamps and Lighting Appliances—High Pressure Gas Lighting—The Lighting of Peterborough Cathedral—Notes on Street Lighting—The Light of Other Days—Notes from Abroad—Correspondence, etc.

*See page III of cover*

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# Progress in Illuminating Engineering

THE opening meeting of the Illuminating Engineering Society (dealt with on pages 325-328 in this issue), was as usual devoted to the exhibit of novelties in the form of lamps, lighting, appliances, instruments, etc., and to reviews of progress. On this occasion, owing to the exceptionally numerous exhibits, it was decided to show these first, and the report presented by the writer was necessarily dealt with somewhat briefly; this report is, however, reproduced *in extenso* in this number.

The exhibits covered a wide field. The ingenious "Mutochrome" demonstrated by Mr. S. H. Groom proved extremely interesting, and should have numerous practical applications. Apart from its utility to designers of wallpapers, coloured fabrics, etc., there is the fascinating possibility of its being applied for the projection of "luminous scenery" in the theatre. Another simple and apparently effective device was the use of half colour-sprayed lamps in automobile projectors, shown by Mr. T. J. Sack, and a useful contribution from Mr. Cunnington illustrated the latest device in the way of illuminated station name-plates—a large sign which can be seen by passengers shortly *before* they arrive at a station. To these exhibits must be added the new long-burning flame arc shown by Captain Risch, the very compact form of integrating cube-photometer sent by Lieut.-Colonel Kenelm Edgcumbe, and the varied array of modern lighting fittings furnished by several leading firms. Consideration of this list shows how we have advanced from the early days of the Society. There is now no difficulty in securing a suitable list of novelties; the only problem is to avoid overcrowding the evening.

With the exception of the ingenious clocks for the automatic control of gas and electric lighting, shown by Mr. Horstmann, gas lighting was not represented amongst the exhibits on this occasion. Those invited to display apparatus of this kind apparently considered that there were no sufficiently striking novelties to display, members of the Society being familiar with the general course of development. We have no doubt, however, that there have been many advances in detail in the design of gas lamps and fittings that deserve to be recorded, and it is hoped that the informal meeting, arranged for early in the new year, will afford another opportunity for some of these to be described.

Apart from the exhibits of novelties, the information presented in the usual report of progress (see pages 325-328) is this year of considerable importance. There is no doubt that illuminating engineering is entering upon a new phase. Since the Illuminating Engineering Society was formed in 1909 we have all been occupied mainly in making experiments and collecting information. The time has now come when this information needs to be broadcasted to the public. It was this consideration that led to the extension of *The Illuminating Engineer*, the official organ of the Society, at the beginning of the present year. The recognition of the need for propaganda in favour of better lighting has likewise led to the development of the E.L.M.A. Lighting Service Bureau and its branches in the provinces—a step on the part of electric lamp manufacturers which has been paralleled by similar activities in several Continental countries. Other ramifications of the illuminating engineering movement are to be seen in the growing series of researches being undertaken by the B.E.S.A. committees, and in the Committee on Illumination working under the Department of Scientific and Industrial Research. The great value of the work that is being quietly done by these various agencies deserves to be more fully recognized. We hope, therefore, that at the first opportune moment the suggestion that two evenings in the programme of the Society should be devoted to a review of these activities will be carried into effect.

The other dominant feature of the progress of the past year has been the internationalization of the illuminating engineering movement. Readers of our journal are doubtless well aware of the activities of the Illuminating Engineering Society in the United States, and the manifold educational efforts of kindred American bodies, now executed on a gigantic scale. There are now also societies with similar aims in Germany, Austria-Hungary, and in Japan. Indeed, in Germany there are now actually three societies concerned with lighting actively at work. In other countries, Czecho-Slovakia for example, there is likewise evidence of continually increasing interest in illuminating engineering.

A great stimulus to these international activities has been given by the International Illumination Commission, with national committees in all the chief countries. When the time comes for the next meeting of the Commission the representation of the chief countries will no doubt be even more complete. It is, therefore, a matter of great moment to the lighting industry that this country should continue to take a leading part in all this work.

# Periods of Development in Illuminating Engineering

IT is always interesting to hear the views expressed by those in other lands when examining progress in illuminating engineering in their respective countries. Readers will doubtless be interested in the stimulating and thoughtful address recently delivered by Professor E. C. Crittenden, last year's President of the Illuminating Engineering Society in the United States, which is reproduced on pages 329-330.

Professor Crittenden, through his association with the Bureau of Standards, is closely in touch with the scientific aspects of illumination, and the writer has a pleasant recollection of conversations with him, in which he expressed keen interest in the work being undertaken in this country.

Professor Crittenden divides progress in illuminating engineering into several stages. There was first the period when the science of light-production and theoretical considerations were being studied and principles evolved; next a stage during which these principles were being applied to practice, and their applications worked out in detail; and finally the present epoch, concerned largely with education and propaganda. In this country we have passed through similar experience. Here, as in the United States and on the Continent, the efforts of the Illuminating Engineering Society are being supplemented by the activities of other organizations, many of them concerned primarily with "putting over" modern lighting as a commercial matter. This is a natural development of the illuminating engineering work, and such organizations are doing extensive and valuable public service.

At the same time, it must not be assumed that the arrival of this new stage means that the aims pursued in the earlier stages can be overlooked. Illumination is still a rapidly developing and constantly changing subject. It is of vital importance that the Illuminating Engineering Society should continue to initiate experiments and collect data, on which propaganda is necessarily based. The latest report of the finances of the American Illuminating Engineering Society shows how very much greater is the support accorded to that body. This is a point to which we shall return in our next number.

# Demonstration of Good and Bad Lighting

IN our next number we shall be giving a full account of the proceedings at the subsequent meeting of the Illuminating Engineering Society, held, by kind invitation of the E.L.M.A., at the Lighting Service Bureau on December 16th. The opportunity was taken to present the usual report of the Committee on Progress in Electric Lamps and Lighting Appliances, which contained a review of various improvements in the details of lamps and recent progress in the lighting of streets, factories, etc. The Military Tattoo at Wembley is mentioned as an instance of spectacular effects on a large scale. Reference was also made to the growing activities of the E.L.M.A., as illustrated by the opening of Bureaux at Glasgow and in the North-East Coast District, and to the further progress towards standardization effected in recent B.E.S.A. specifications.

Following the presentation of the report, visitors were given a demonstration of the methods of illustrating good and bad methods of shop-lighting. This has been already described in this journal,* but was witnessed by many of those present for the first time. A new item shown on this occasion was the demonstration of domestic lighting, very ably carried out by Miss F. Hodge. Methods of showing the comparative effects of modern and obsolete domestic fittings were quite effective, and visitors were impressed by the ingenuity with which the quick changes in lighting equipment were carried out, a dining-room, kitchen, bedroom and drawing-room being dealt with in turn.

After an interval for refreshments there was a good discussion, and a vote of thanks to the E.L.M.A. and to Mr. C. W. Sulley for presiding terminated a most enjoyable evening.

# The Comparison of Natural and Artificial Lighting

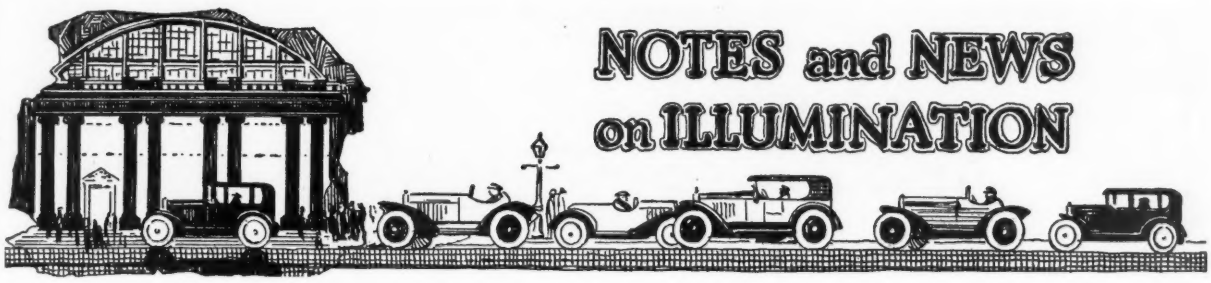
IN connection with the efforts that are now being made to trace the relation between better lighting and higher efficiency of work, it is natural that experimenters should try to base their conclusions on the results achieved by daylight.

The greater part of the work of the world is still done by natural light, and a comparison between natural and artificial lighting conditions affords much interesting information. It is doubtful, however, whether all investigators realize the complexity of the factors involved in such a comparison. The illumination available by the best daylight conditions is far greater than is usually furnished by artificial means. On the other hand, daylight is a highly variable quantity. Photometric measurements show that remarkable changes may occur even during a relatively short working period. In making comparisons, the experimenter is usually driven to adopt as a measure the *average* daylight illumination during the working period. But it is questionable whether an average between illuminations varying, perhaps, in a ratio of 10 to 1 can be regarded as a measure of the effective daylight illumination. The eye is inevitably affected by these changes, and it would seem better, in making comparisons, to devise some method (e.g., by adjustment of blinds) by which the actual daylight illumination can be kept practically constant during the test period.

Again, the *nature* of daylight illumination, as well as the intensity, may be quite different from artificial light. The presence of the bright sky overhead out of doors causes corresponding adaptation of the eye, and leads it to demand illuminations much higher than might otherwise be required. Even in a room the presence of a window near at hand, through which the sky can be seen, has a similar effect.

Taking all these facts into consideration, it is not surprising that quite different answers are often received to the simple question: "Does one require more or less illumination by natural light than by artificial light?" The whole subject is one that deserves careful investigation, and would furnish material for an interesting discussion. Meantime there is one obvious lesson—investigators who attempt to make comparisons between artificial and natural lighting should be careful to specify as exactly as possible the daylight conditions in the room in which the comparison is made. Daylight illumination is not under our control, but an increase in artificial lighting involves corresponding increased cost. If standards recommended to consumers are unnecessarily high, a reaction towards economy and a set-back to future progress may occur. Supply undertakings could, however, materially smooth the path towards higher illuminations by closer co-operation and reduced rates.

* *Illum. Eng.*, October., 1925. Pages 278-280.




## Illuminated Posters

In our last issue we referred to the many good examples of illuminated posters now being installed, mentioning particularly the striking tobacco hoarding facing King's Cross Station. The West End entertainment centre is also full of interest, as new signs are constantly appearing. One of the most successful recently put up is the "Rose Marie" poster at a corner in Shaftesbury Avenue. Doubtless it gains much from its position. But the effect of the concealed lamps is very uniform—a result possibly due in some measure to the convex nature of the surface carrying the coloured picture. Instances of flood-lighting continue to multiply. One difficulty in this country has always been the problem of getting access to a neighbouring site, so that light can be projected from a fair distance, e.g., from across the road. It is not often that this method is practicable, but a case in point is afforded by the frontage of the Lyons's building in Coventry Street, illuminated by a battery of reflectors mounted in windows of the opposite building. Seen from this opposite side of the street the effect is quite good; but from the other side of the road the projectors, being mounted just above the shop level, are rather too visible. In such cases it is preferable that one should not be able to see the "works."

## London Fogs

As we write these words London is enveloped in a fog converting day into night, and with many of the characteristics of the celebrated fogs of the last century. Notwithstanding all the efforts of the Sunlight League and the Smoke Abatement League, we are still subject to this evil, and it remains as difficult as ever to forecast when a fog of peculiar density will appear. The effect of losing a complete day's sunshine—possibly several days'—on health must be considerable, quite apart from the economic loss involved in the disturbance of traffic. The usual efforts have been made to cope with the problem by the occasional use of flares. But the arrival of a fog never fails to call forth criticism of the ordinary methods of street lighting. One must remember that even in this country a dense fog is the exception, and that public lighting is adapted to normal conditions. This is no reason, however, why the authorities should be found at a loss; we have suggested several times that there should be some regular system of emergency illuminants in reserve, and that all possible means of alleviating the conditions should be schemed out so as to be available when the need occurs.

## Co-operative Street Lighting in Sheffield

We understand that in a narrow street (Change Alley) off High Street, in Sheffield, the shopkeepers are co-operating with the Corporation in improving the lighting. Convinced that bright lighting attracts custom, they have fallen in with the project of installing six 500-watt Wembly lanterns at a height of 18 feet and 17 feet apart. Four of these lamps are being erected and maintained by the shopkeepers, and two are being taken over by the Corporation as part of the public lighting. The lamps owned by the proprietors will be extinguished by a time switch at 11 p.m. each night, whereas the public lamps will be kept alight until dawn. This is, of course, not the first instance of such co-operation, but it is an enterprising departure which might well be imitated in other cities.

## The North-East Coast Lighting Service Bureau

We observe that the above Bureau, which has its headquarters in Newcastle-on-Tyne, is now in full swing. During November 23rd to 25th the "school" was in operation, lectures on a variety of subjects being given. Amongst these may be noted "The Magnitude of the Lighting Business" (Mr. W. E. Bush), "Lighting Fundamentals and Principles of Diffusion" (Mr. W. J. Jones), "The Measurement of Illumination" (Mr. W. E. Bush), "Practical Lighting Demonstrations" (Mr. S. O. Cook), "Lamp Manufacture and Lighting Economies" (Mr. F. J. Hawkins), "Simplified Methods of Designing Illumination Schemes" (Mr. W. Millner), "Solving Industrial Lighting Problems" (Mr. E. S. Evans), "Lighting Design for Shops and Stores" (Mr. W. Millner), "Shop Window Lighting" (Mr. E. S. Evans), "Electrical Advertising and Colour Lighting" (Mr. L. E. Buckell), "Home Lighting" (Miss F. Hodge), "Street Lighting" (Mr. W. J. Jones), "Light and the Central Station" (Mr. C. A. Hughes), "Flood-Lighting" (Mr. E. S. Evans), "Standardization of Lamps and Lighting Equipment" (Mr. C. A. Hughes), "Selling Better Lighting" (Mr. W. J. Jones).

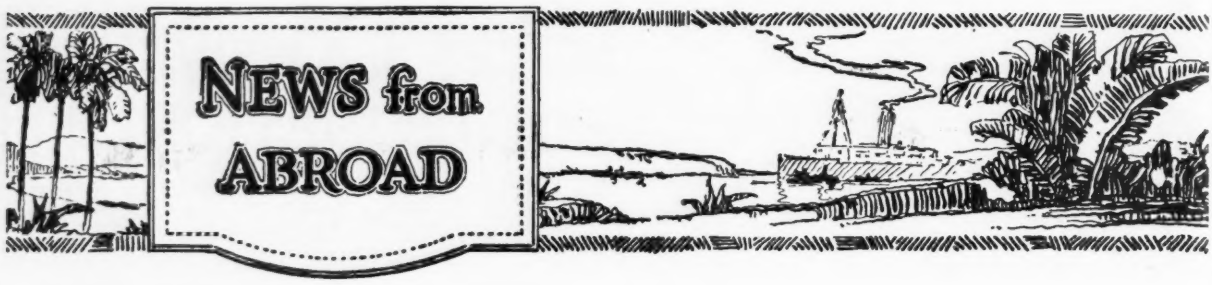
The lectures thus covered a wide ground, and must have conveyed a good idea of the possibilities of illuminating engineering to people in the Newcastle district. We shall watch the progress of the Bureau's activities with great interest.

## Shop-Window Lighting
## A Demonstration at Pudsey

Pudsey is perhaps not very well known to Londoners, though it figures in many topical stories, and is regarded with affection by people in the North of England. Pudsey, however, is moving with the times. About seventy shopkeepers and assistants in the district recently attended a lecture-demonstration given by Mr. Geo. Herbert on "Shop-window Lighting." Mr. Rodway, the headmaster of the School of Art, started the movement in favour of better shop-window displays some months ago, and opened a class for training assistants in this field. An improvised shop-window had been fitted up for the demonstration, and some striking illustrations of good and bad lighting were shown. Mr. Herbert demonstrated various methods of concealed lighting and the use of colour, and particularly emphasized the common sense of avoiding glare from exposed lights. He also recommended, in view of the opening of the Christmas season, that Pudsey merchants should keep their windows lighted for two or three hours after closing time—a suggestion that seemed to receive the approval of the audience.

## The Light of Other Days

An illustrated lecture on the above subject was given by Mr. J. Darch at the Wandsworth Technical Institute, on December 3rd, before a young and appreciative audience. The talk was illustrated by an excellent series of slides, tracing the development of illuminants from the wood-fire of primitive man up to the original lighting of Pall Mall by gas (as portrayed in an old print). The series of slides of oil lamps of the Roman type was particularly complete, and the author has evidently collected a series of illustrations of old illuminants that must be nearly unique.




## Public Lighting on the Continent

In alluding to the proceedings at the recent annual meeting of the Illuminating Engineering Society in Germany we remarked on the views expressed by several speakers in favour of concentrating reflectors (Tiefstrahler) completely concealing the filament from view for street lighting. Opinion abroad seems to be turning strongly towards this method of lighting, the dominant consideration being the elimination of all glare from light sources. Drivers of vehicles, it is said, prefer this system even when it occasions some lack of uniformity in illumination. A correspondent who has been visiting various Continental cities confirms this impression. We instanced the lighting of a large square adjacent to the chief railway station at Amsterdam, where such reflectors are used, and not a filament is visible. In other cities he has observed the same tendency to adopt in public lighting methods approaching much nearer to those usually found in the factory. In some cases the illumination provided is remarkably high. It is also stated that the special forms of units being introduced on the Continent (deep metal reflectors with an inner prismatic glass lining) enable a comparatively extensive curve to be obtained, even when the filament is completely concealed. In some specially designed installations the diversity coefficient does not exceed 5 to 1. An objection commonly urged against the use of opaque reflectors is that the upper parts of buildings appear too dark. In squares where this method is being mainly used, this objection does not apply to the same extent. But even in streets it is contended that the reflected light largely obviates this drawback, and that, with glare completely eliminated, the eye really sees more of the surroundings than with comparatively exposed lights.

## The Journal of the Illuminating Engineering Society in Japan—A Welcome Improvement

We have several times expressed the hope that the Japanese Illuminating Engineering Society would render their good work more accessible to British readers by including in their Journal abstracts of the chief papers, in English; hitherto they have been published exclusively in Japanese. It is with great pleasure, therefore, that one observes a welcome change in the last issue received. On the front cover the name and address of the Society and the names of authors and titles of papers appear side by side in both Japanese and English. The same method is repeated with the titles of papers throughout the volume, and in several cases a short abstract is also given. We notice in the proceedings an account by Mr. K. Tachibana, of the "Electric Home" at Chefoo, and its possibilities as a means of propaganda. There are illustrations showing the lighting equipment provided. There is also a description of the street-lighting in Tokyo. A feature is the occasional use of wooden posts, with more or less ornamental fittings. In some cases quite high illumination (e.g., a minimum of 0·2 foot-candles) seem to be recorded. The Journal also includes an abstract of current literature on illumination.

## The Production of Electric Lamps and Gas Mantles in Germany

In a recent issue of *Licht und Lampe*, the available statistics relating to the production of lamps in Germany are presented. Apparently there has been, despite increased internal demand, a reduction of 16·5 per cent. in the total production of electric lamps, and 2·5 per cent. for gas mantles for 1924, as compared with 1923. This arises from the marked diminution in regard to exported products, for which the shrinkages are 19·5 per cent. and 17·8 per cent. respectively. These results are attributed mainly to the effect of foreign tariffs.

The following figures relating to 1924 are of interest, the corresponding figures for 1923 being given in brackets: Electric metal filament lamps, 71,510,454 (85,685,292); gas mantles, 45,658,395 (46,804,777); mercury-vapour lamps, etc., 4,192 (2,077); carbons for arc lamps, 715,806 (709,350). It is noteworthy that in the case of carbons, and also mercury-vapour and similar lamps the production for 1924 increased somewhat.

## Sales of Lamps by Electric Supply Undertakings

The manner in which electric supply undertakings in the United States work hand in hand with lamp manufacturers is strikingly illustrated by some data recently given in *The Electrical World*. It is stated that during the first three months of this year the Henry L. Doherty & Company undertakings conducted an intensive lamp campaign in their district, with the object of increasing the lighting load by the sales of lamps of larger wattage to replace those already in use or to be inserted in empty sockets. The effort was also made to unite this campaign with "service" to the consumer in recommending correct methods of illumination.

As a result the lamp sales during these three months were treble what they were in the corresponding months of 1923. At the same time, the average wattage per lamp sold was raised to 60—which is 50 per cent. higher than the general average over the country as a whole, and should proportionately benefit the supply undertakings. It is stated that the customers are also pleased with the better lighting—in short, "everybody's satisfied."

## Illuminating Engineering in Germany

On December 3rd a meeting of the German Illuminating Engineering Society was held, the subject of discussion being "The Ulbricht Globe," introduced by Dr. J. H. Hartinger. Records of experience with this apparatus were also presented by Dr. Lux, Professor Wedding, and others.

We note that the Illumination Society in the Rhineland and Westphalian District held its annual meeting on December 10th, one of the chief items on this occasion being the paper by Professor Dr. J. Teichmüller, entitled "Considerations Dealing with Fundamental Photometric Quantities, Laws and Measurements."

# TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

*The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.*

## Progress in Illuminating Engineering

*(Proceedings at the Opening Meeting of the Illuminating Engineering Society, held at the House of the Royal Society of Arts, 18, John Street, Adelphi, London, W.C., at 8 p.m. on Thursday, November 26, 1925.)*

THE opening meeting of the Illuminating Engineering Society was held at the House of the Royal Society of Arts, at 8 p.m. on Thursday, November 26th, 1925, the chair being taken by Mr. Justus Eck.

Before the opening of proceedings the Chairman alluded to the great loss sustained by the nation in the death of the Queen Mother, Queen Alexandra, and the following resolution was put to the meeting and carried unanimously, all standing*:—

***"That the Officers, Council, and Members of the Illuminating Engineering Society desire to put on record their deep regret at the death of the Queen Mother, Queen Alexandra—mourned by the whole nation; whose care for the welfare of her people was exemplified by her interest in the subject of light and health and her early encouragement of the introduction of special lamps for medical treatment from Denmark; and that the Officers, Council and Members of this Society respectfully express their deep sympathy with His Majesty King George and the Royal Family in the bereavement they have sustained."***

The minutes of the last meeting having been taken as read, the Hon. Secretary announced the names of new applicants for membership, which were as follows:—

Applebee, L. G.....Electrical Engineer, The Strand Electrical and Engineering Co. Ltd.., 24, Floral Street, LONDON, W.C.2.

Bark, B. .....Works Manager, Welsbach Light Co. Ltd., Broomhill Road, Wandsworth, LONDON, S.W.

Berry, W. .....Illuminating Engineer, Holophane Ltd., Severn Lodge, SHREWSBURY.

Davies, C. H. .....Kinema Technical Consultant, 15, Wardour House, Wardour Street, LONDON, W.1.

Holmes, T. J. .....Electrical Contractor, Parsonage Street, DURSLEY, Glos.

Littlewood, H. .....Lighting Fixtures Department, General Electric Co. Ltd., 17, Reservoir Road, Edgeley Park, STOCKPORT.

Livingstone, J. .....Electrical Engineer, Glasgow Corporation, Electrical Department, GLASGOW.

Marr, J. B. .....Electrical Contractor, 53. Victoria Street, LONDON, S.W.1.

Tribe, W. A. F. .....Electrical Engineer, Electrical Services Ltd., 27, Martin's Lane, LONDON, E.C.4.

Mahoney, J. .....Benjamin Electric Ltd., Brantwood Works, Tariff Road, Northumberland Park, Tottenham, LONDON, N.17.

Walsh J. .....Electrical Engineer, 2, King Street, BLACKBURN.

The Hon. Secretary also read out again the names of applicants presented at the last meeting,† and these gentlemen were formally declared members of the Society.

The HON. SECRETARY also referred to the growing number of corresponding members and correspondents to the journal, whose co-operation should be very valuable in keeping members informed of progress in other countries, and facilitating international co-operation generally. Frequent additions were being made to the list which now includes, amongst others: *United States of America*, Professor E. C. Crittenden, President of the Illuminating Engineering Society, U.S.A., Mr. P. S. Millar, Professor A. E. Kenelly, Dr. Ives, etc.; *France*, Professor J. Blondin, Professor A. Blondel, Professor Th. Vautier, etc.; *Italy*, Sig. M. Böhm; *Germany*, Dr. L. Bloch, President of the Illuminating Engineering Society in Germany, Dr. H. Lux, Herr O. Heyck, Herr Ing. Mylo, Professor W. Wedding, etc.; *Switzerland*, Professor J. Landry; *Austria*, Dr. H. Strache; *Czecho-Slovakia*, Professor Dr. F. Niethammer; *Russia*, Mr. S. Maisel, Dr. M. Zelentschoff, etc.; *Japan*, Mr. Nakashima.

### REPORTS AND EXHIBITS.

The CHAIRMAN then recalled that, in accordance with the usual custom, the meeting was to be devoted to reports on progress and exhibits of novelties. A report on "Recent Progress in Illuminating Engineering" was to be presented by Mr. L. Gaster, and there were also a considerable number of lighting devices to be shown. It was proposed on this occasion that these various exhibits should first be dealt with, in order to ensure time being available for all to be seen.

The CHAIRMAN accordingly called upon CAPTAIN RISCH to exhibit the new "Dia" Long-burning Flame Arc, which was shown in operation hung from the dome of the lecture hall. The feature of this lamp is the special design of the globe, which enables an arc between two vertical-flame carbons to be enclosed, without the light being prejudiced by the deposit of fumes on the glass, a burning period of 120 hours, before it becomes necessary to insert new carbons, being secured.

The next item was the demonstration of the Mutochrome Projector by Mr. S. H. GROOM. By the aid of this ingenious device a series of patterns dovetailing into each other is thrown on the screen, and the intensity of each can be varied at will. In this way the colour-pattern can be altered to any extent—a process that seems likely to be of considerable value to designers of wallpapers, dress materials, carpets, etc., besides having interesting possibilities on the stage.

A specimen of the Cubical Integrating Photometer, sent by LT.-COL. KENELM EDGCUMBE, was then exhibited. It may be recalled that this apparatus was described in our February issue.* Mr. T. SACK (General Electric Co. Ltd.) exhibited a headlight equipped with lamps having one-half "colour-sprayed," with the result that the degree of dazzle from an ordinary headlight is very much reduced; light above a certain horizontal plane being

* A letter from His Majesty the King, graciously acknowledging the receipt of this resolution, has since been received, and will be found on page 328.

† *Illum. Eng.*, July, 1925. Page 179.

* *Illum. Eng.*, February, 1925. Page 49.

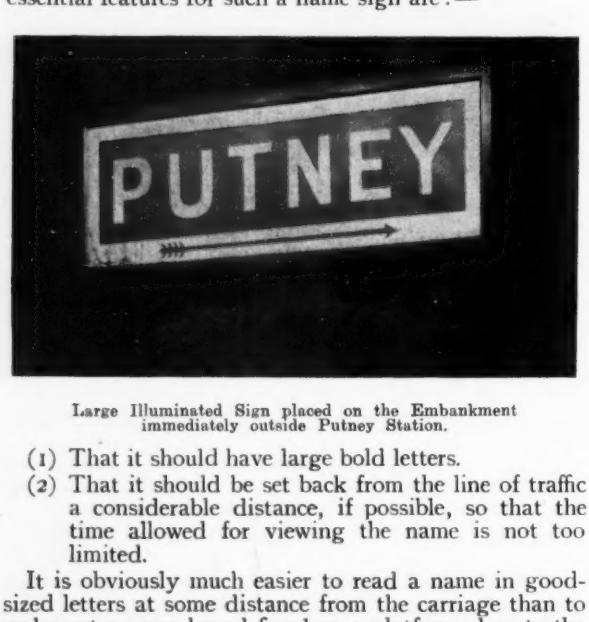
diffused and softened by the yellow coating of the bulb, so that direct rays from the filament do not enter the eyes of approaching persons or drivers.

Various novel forms of lighting fittings were also shown in operation by Mr. R. A. IVES (Benjamin Electric Ltd.), Mr. H. H. LONG (Metro-Vick Supplies Ltd.), and Mr. A. J. DALLADAY (J. W. Atha & Co. Ltd.), and finally Mr. J. HORSTMAN gave a demonstration of various types of time-switches for the control of gas and electric lighting.

A more detailed account of all these exhibits will be found on pages 333-338.

### ILLUMINATED RAILWAY NAME PLATES.

Mr. A. CUNNINGTON (Southern Railway) exhibited a slide illustrating a new type of large name board which is being adopted experimentally on the Southern Railway. He pointed out that a good deal of attention had recently been given to the question of making clear the name of a station to the passengers, especially on the suburban services. In view of the considerable speed attained, and the short stops which are allowed at stations, it is desirable that passengers should have an opportunity of making up their minds as to the name of the station that they are approaching, so as to be ready to alight if necessary, and it was with this in mind that a suggestion was put forward to adopt a plan which has been in use in a modified form on the Continent. Visitors to Northern France will remember the conspicuous names of the stations which are often painted in large letters on a goods shed, signal box, or other buildings just before the station is entered. In the case of the London suburban stations it was not feasible to adopt this method, so sites have been selected for several large name boards, on which the name of the station is clearly indicated, and which are illuminated at night. The essential features for such a name sign are: —




Large Illuminated Sign placed on the Embankment immediately outside Putney Station.

(1) That it should have large bold letters.
(2) That it should be set back from the line of traffic a considerable distance, if possible, so that the time allowed for viewing the name is not too limited.

It is obviously much easier to read a name in good-sized letters at some distance from the carriage than to make out a name board fixed on a platform close to the carriage windows. As the signs are fixed some little distance from the station they are being passed just as the train commences to slow up, at which time passengers frequently look out of the window. As trains might occasionally pull up at the home signal just outside the platform, care has been taken to place the boards on the inner side of this signal, so that there is no risk of passengers alighting before the platform is reached. Further, to avoid confusion, an arrow is placed on the board indicating that the station concerned is a little farther on. The illumination of the board at Putney has been carried out by means of four simple angle reflectors with 60-watt gasfilled lamps. It will be appreciated that as the signs are surrounded by darkness at night a comparatively small order of illumination is sufficient to make them quite conspicuous. A sign has been erected at Wimbledon similar to the one at Putney, and others are being erected elsewhere. It should be understood that these names are purely supplementary to the ordinary indications of the station name which are required by regulations to be fixed to the lamps on the platforms. This aspect of the matter has also received special attention recently, and improved name plates which are conspicuously lighted by the platform lamps are becoming a feature of the Southern Railway stations.

The CHAIRMAN then called upon Mr. L. GASTER to present his report on "Recent Progress in Illuminating Engineering," which was as follows: —

## Recent Progress in Illuminating Engineering

By L. GASTER, F.J.I.

It is usual to commence the session with a review of progress, and before referring to some important events during the vacation it may be well to recall that our last session was one of exceptional activity. The usual papers and discussions covered a wide range. They included an introductory review of progress at the opening meeting last November, when many interesting novelties were shown, and a subsequent gathering at the E.L.M.A. Lighting Service Bureau, when the previous meeting was supplemented by exhibits of the latest electric lamps and fittings and by various demonstrations. The next item was a paper by Mr. J. W. T. Walsh, who drew attention to the nature of the shadows cast by extensive illuminated surfaces and their effect on the resultant illumination. The Society again met at the premises of the E.L.M.A. Lighting Service Bureau on May 19th, when a useful Survey of Lighting in 800 Retail Shops was presented by Messrs. W. J. Jones and H. Lingard. Later Dr. W. Saleeby dealt with a subject of great present interest, "Natural and Artificial Sunlight in Health and Disease."

As indicated last year, the present period is being marked by a distinct increase in interest in illumination on the parts of all sections of the community. The official organ of the Society, which has now almost completed a year under the new conditions, has been issued regularly in an extended form, and is continually reaching new circles of the public. Another new feature during the past year was the arrangement of informal visits and discussions. Three events of this kind were organized during the past year; the visit to Selfridge's and the Army and Navy Stores to inspect the lighting arrangements, followed by a discussion at which Mr. J. H. J. Clarke, the Manager of the Staff at Selfridge's, presided; a visit to Waterloo Station, again followed by a discussion, which was attended by representatives of many of the chief railway systems; and the visit to Drury Lane Theatre, which, by the courtesy of the General Electric Co. Ltd., was followed by a discussion at Magnet House.

### COURSES IN ILLUMINATING ENGINEERING.

Yet another important step was the series of lectures on illuminating engineering, each delivered by an expert on the special aspect of lighting dealt with, at the Polytechnic (Regent Street, London). This course proved a complete success, and led the Polytechnic to take the enterprising step of arranging a permanent course in illuminating engineering, which is now proceeding. It has to be regretted that the more extended course has not received from the lighting industry the support anticipated, and it is possible that for the moment the wiser method would be to incorporate such extended courses in some regular scheme of study for students, rather than attempting to organize it as a separate venture. One is glad to note, however, that the Polytechnic is persevering in this enterprising departure. It is to be hoped that other educational institutions will likewise make arrangements to deal more fully with illuminating engineering in their syllabus, and that other courses will be arranged. The question of producing a special text-book on illuminating engineering for the use of teachers and students is also receiving consideration.

### OTHER PROPAGANDA WORK.

Educational work of this kind is essentially within the province of the Illuminating Engineering Society, and no doubt gas and electric supply undertakings, who are

now making a feature of "service" to consumers, will co-operate with it in arranging courses of instruction for the benefit of those who are to become "illuminating engineers" and advise the public. Meantime I may record the useful supplementary work that is being done by the E.L.M.A. Lighting Service Bureau by the organization of courses for salesmen and by its propaganda amongst various classes of consumers in favour of better lighting.

The months of June and July were noteworthy for the I.M.E.A. Convention at Brighton and the meetings of the National Gas Council and the Institution of Gas Engineers. The dominant point at the I.M.E.A. meeting was the recognition that electrical supply undertakings should do more to stimulate the demand for electricity by means of propaganda and by adopting "service to the consumer" as an essential part of their programme. This point has likewise been emphasized by representatives of the gas industry. In either case progress depends very largely on the study, by supply undertakings, of illuminating engineering.

At the annual meeting of the Institution of Gas Engineers an account of the proceedings at the meeting of the International Illumination Commission in Geneva was presented by Mr. Watson and Mr. Dunn, and the former expressed the hope that the Institution would maintain its interest in illumination with gas. The President assured Mr. Watson that this would be done, and one is glad to note this official recognition of the importance of the lighting field.

### Street Lighting.

At the I.M.E.A. a paper on Street Lighting was read by Mr. Haydn T. Harrison, and the discussion revealed a general recognition of the need for improvement, in view of the continual increase in the volume of motor traffic. It is evident, however, that future progress depends greatly on the education of public opinion. In this connection the writer has several times suggested that an official inquiry into street accidents should be held, with a view to tracing the part played by inadequate and unsatisfactory lighting. The acquirement of these data would lead to the recognition that responsibility for any accidents due to lack of adequate and suitable street lighting should rest on the public authority concerned.

Street lighting again formed the subject of several papers read before the Institution of Public Lighting Engineers at their annual meeting in Leeds; and it was the main topic discussed at the annual meeting of the Illuminating Engineering Society in Germany, held at Munich. In that country public lighting generally has not yet been brought up to pre-war standard, though in some cities, notably Berlin, substantial progress has recently been made. In various cities in the United States, on the other hand, very extensive street-lighting schemes are recorded, one interesting item being the adoption of 25,000 lumen (approximately 2,000 candle-power) units in Cleveland—apparently the most powerful forms of units yet adopted in that country for public lighting. Much interest has been expressed in the possibility of using luminous and other devices for the control of traffic. A visit was recently paid to the States by Sir Henry Maybury with the object of studying American methods, and it is possible that some of these will be found useful in congested cities in this country.

### Industrial Lighting.

The question of industrial lighting is discussed in the Report of H.M. Inspector of Factories for the past year, and measurements recently made in various factories yield encouraging results. Many improvements have been observed, and one case is mentioned where 13-23 foot-candles are now provided, as compared with 1 foot-candle formerly available. The two years that have elapsed since the issue of the Third Interim Report of the Departmental Committee on Lighting in Factories and Workshops have been utilized in bringing these recommendations to the notice of managers. Great interest has been shown, and offers to send an inspector equipped with an illumination-photometer have been welcomed. It is evident that the work of the Home Office Committee has had a material influence on industrial lighting, and the sympathetic methods of the Home Office in enlisting the aid of the industrial councils and encouragement in the study of lighting conditions has had good results. Industrial councils are now becoming keenly interested in the subject, and the writer has recently delivered another lecture, which formed one of a series arranged by the Department of Industrial Administration at the Polytechnic, with the co-operation of the National Industrial Alliance.

In approaching managers in regard to illumination data showing the nature of the benefits to be obtained are of great value. In this connection the results of a research conducted in American post offices, and summarized by Dr. J. F. Ives, of the U.S.A. Public Health Service,* deserve attention; and likewise the series of experiments recently made in Berlin with a view to establishing a relation between intensity of illumination and speed and precision of work.†

### The Committee on Illumination Working under the Department for Scientific and Industrial Research.

Much important work is also being undertaken by the Committee on Illumination working under the Department for Scientific and Industrial Research. One Sub-committee is studying the conditions of illumination necessary for difficult factory processes, such as the lighting requirements of compositors —an investigation being conducted with the co-operation of the Industrial Council of the Printing and Allied Trades. Another Sub-committee is studying daylight illumination in schools, factories, etc. Research is also being conducted for various Government Departments, and yet other investigations have been initiated at the request of the Illumination Committee of the B.E.S.A., which is drafting various specifications for types of lighting fittings, street lighting, portable photometers, etc.

An allusion is made to this research on illumination in the annual report of the Department for Scientific and Industrial Research, which describes these activities as of direct interest to the community, both on general grounds and as users of light. The Committee is in close touch with the Illuminating Engineering Society, the B.E.S.A., and research institutions abroad, and it has in the National Physical Laboratory an excellent centre for the carrying out of researches. Its representative character—it receives the aid of eminent medical men and architects, besides lighting experts—renders its work of great value, both to the lighting industry and the public. In fact, it constitutes an organization for impartial research in illuminating engineering which cannot be paralleled in any other country at the present time.

### The B.E.S.A. Committees.

In the various committees of the B.E.S.A., alluded to above, we have another organization which is carrying on investigations in illuminating engineering. This work is designed primarily to promote standardization, and it is significant that illuminating engineering has now reached a stage where standardization in a number of fields appears practicable. A valuable Standard Specification for Portable Photometers has been recently issued, and will appear in the next issue of *The Illuminating Engineer*. Other reports will be available in the near future.

It will be observed that all these activities are interlinked with the Illuminating Engineering Society, which also serves the useful purpose of providing an impartial platform where all the fruits of these experiments can be presented. It has been suggested that a meeting should be devoted shortly to a discussion of some of this work, so that, as in other similar instances in the past, the Society may be the means of making this valuable work more widely known.

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* *Illum. Eng.*, Aug., 1925.

† *Illum. Eng.*, April, 1925.

### Specialist Libraries.

In passing I would like to refer to another recent meeting of considerable interest to our Society—the conference of the Association of Special Libraries and Information Bureaux, held in Oxford last September. The organization of special libraries is a matter of great consequence to students and experts of all kinds. On many subjects specialized libraries already exist, but the literature of illuminating engineering is extremely scattered, and a well-organized library devoted to this subject would be a great boon. Another feature of the Association's work is its international aspect. Papers by representatives of many countries were read, and the possibility of creating a world catalogue of technical and special books was considered.

### Development Abroad.

I now pass on to developments in other countries and international aspects of illumination. One significant development has been the organization of demonstration centres in various countries abroad, similar to the E.L.M.A. Lighting Service Bureau in London (whose activities have been recently extended by the initiation of bureaux in Glasgow and Newcastle-on-Tyne). At the "Lichthaus" of the Osram G.m.b.H. in Berlin similar demonstrations are arranged, and a complete course of lectures on various aspects of lighting was arranged during September and October. Similar propaganda centres now exist in Paris, and also in Italy and Austria-Hungary, and a number of special exhibitions devoted to electric lighting have recently been arranged.

We see here evidence of the growth of the illuminating engineering movement in various parts of the world. The activities of the Illuminating Engineering Society in the United States are familiar to our members, and the series of papers read at the recent nineteenth annual Convention in Detroit illustrated its wide and growing interests. The Illuminating Engineering Society in Japan appears to be making steady progress. An account of the proceedings at the recent annual meeting of the Illuminating Engineering Society in Germany will appear in the next issue of *The Illuminating Engineer*. It may be recalled that in Germany there are now two other bodies concerned with illuminating engineering, located in Karlsruhe and in the Rhineland district, which are in effect branches of the Illuminating Engineering Society with headquarters in Berlin. Evidence of interest in lighting matters in Czecho-Slovakia is also afforded by the contributions which we have recently received from Professor Dr. Niethammer, of the University of Prague.

These international developments are of great consequence by lighting experts in this country, and we are accordingly making special arrangements to include in the official organ news of all progress abroad.

I may also mention another step of great importance that has recently been taken, the arrangement of regular interchange of papers with the Illuminating Engineering Societies in the United States and Germany, and other bodies abroad. This step should help towards common action in lighting matters, and may pave the way for further co-operation—for example, simultaneous discussions before these various societies on subjects of common interest, so that the experience of different countries may be collected and compared.

### Hygienic Aspects of Illumination.

The writer had further opportunities of studying developments on the Continent when participating in the Fourth International Medical Congress of Industrial Diseases and Accidents (held in Amsterdam in September), and the First International Assembly of the Technical Press (held in Paris during October). At the first of these congresses he presented a paper on Industrial Lighting, and on both occasions he had opportunities of meeting experts abroad and forming relations which should be of great future benefit to the movement. The hygienists in Amsterdam took a keen interest in lighting, and one found a general recognition that their aid is indispensable in dealing with illumination in schools, factories, etc. They were much interested in the work of the Committee on Illumination, working under the Department of Scientific and Industrial Research, which not only itself contains medical men, but acts in co-operation with the special committee of the ophthalmic surgeons and physiologists recently formed by the Medical Research Council to study lighting problems.

Another aspect of this problem was presented at the International Congress on Radiology held in London at the end of July, which was attended by experts from many different countries. Several of the papers dealt with the use of light in medical treatment and the possibilities of artificial sunlight, alluded to in Dr. Saleeby's address before our Society in June. It is evident that there exists here another fruitful field for co-operation between the lighting expert and the medical profession—as illustrated by the reported scheme to create a vast "artificial Riviera" and swimming bath in Berlin.

These congresses may be mentioned as helping towards the study of the hygienic aspects of illumination, on which such stress was laid at the international congress that took place in Geneva last year. Whilst fully aware of the merits of other appeals in favour of better lighting (for instance the possibilities of more efficient production, or the favourable influence upon trade), I would suggest that this Society should make every effort to direct attention to the value of good lighting in the interests of health, and to enlist the powerful aid of the medical profession in this work.

### Conclusion.

We see, therefore, a general growth of interest in illumination in all countries, and also a continually increasing tendency towards international treatment of scientific subjects, exemplified at many congresses during the present year. *The Illuminating Engineer* should, as time goes on, serve to act to an ever greater extent as a link between the movements in various countries, and it is most important that we, in this country, should be kept in touch with what is happening abroad. At forthcoming meetings of the International Illumination Commission it may be expected that all the leading countries will be fully represented, and that it will become truly international in its scope.

It is to be hoped that this country will be prepared to take an active part in these deliberations, and it is of the greatest importance that the Illuminating Engineering Society should receive adequate support from the lighting industry, and be enabled to express the national view in regard to lighting matters.

A vote of thanks to the Authors and Exhibitors terminated the proceedings, after which the Chairman announced that the next meeting would be held at the E.L.M.A. Lighting Service Bureau in December, when a report on progress in electric lamps and lighting appliances would be presented, and there would be demonstrations of new lighting fittings, shop lighting and domestic lighting.

## Resolution in Regard to the Death of the Queen-Mother, Queen Alexandra

The resolution in connection with the death of the Queen-Mother, Queen Alexandra, passed at the opening meeting of the Illuminating Engineering Society on November 26th (see page 325), was duly conveyed to His Majesty King George, from whom the following gracious acknowledgment has since been received:—

Home Office, Whitehall,
5th December, 1925.

The Honorary Secretary,
The Illuminating Engineering Society,
32, Victoria Street, S.W.1.

Sir,

I am directed by the Secretary of State to inform you that the loyal and dutiful resolution of the Illuminating Engineering Society, on the occasion of the lamented death of Her late Majesty Queen Alexandra, has been laid before the King, who has commanded the Secretary of State to convey to you His Majesty's thanks for this expression of their sympathy.

I am, Sir, your obedient servant,
(Signed) A. J. Eagleston.

# Presidential Address to the Illuminating Engineering Society (U.S.A.)*

By E. C. CRITTENDEN

WHEN we inaugurate a President of the United States, we expect his inaugural address to set forth the policies he intends to pursue. In technical societies, however, it seems to be recognized that hindsight is better than foresight, and the custom holds of asking a president at the close of his term to record the wisdom born of his experience for the guidance of future administrations. In accordance with this custom I wish to put before you certain considerations regarding our Society which may bear restating, though they are by no means novel.

In the affairs of institutions, as of men, it is perhaps well that there should be occasionally a time set aside for introspection, a time when we shall stop to question what we are and whither we are going. For most of us, daily duties point the way along a path from which we can not wander far without danger; yet we know it is equally dangerous to let the demands of the day be our only guide. Strong as the grip of fate may be upon us, we like to feel that we are masters of it—that we can, if we will, choose our course.

A society, even more than an individual, is constrained to move along the lines which its history has established. The real meaning of evolution is that the organism which lives and grows and perpetuates itself is the one which fits itself into its environment and plays successfully the great game of give and take. Social organisms, like animal forms, thrive when they fit into their surroundings, but become decadent or extinct when they cease to serve the purposes of their times. We might, perhaps, therefore assume that the continuing growth and prosperity of our own Society is in itself a proof that it is serving a real purpose. The details of this growth and activity of the Society are set forth in the reports which our efficient General Secretary has prepared. I shall not take your time to repeat them, but shall ask you to consider with me a more fundamental question. Baldly stated, it is this—Is there good reason for the continued existence of a specialized society dealing with illumination alone? And if so, along what lines should its energies be directed in order to bring the most valuable results?

Many of us have found that the multiplication of scientific and engineering societies and associations, foundations and federations, councils, committees and commissions make a severe drain upon our resources. Sometimes it seems that more energy is being spent in operating the mere machinery of organization than in accomplishing the results it is intended to gain. With particular reference to our own situation, one might take the view that in so far as illumination depends on physical science there are other societies which afford a forum for the discussion of our problems. On the technical engineering side it is suggested that, since electricity seems to be more and more dominating the field of illumination, illuminating engineering might be considered as a branch of electrical engineering, leaving application problems of more commercial nature to still other organizations. Being thus surrounded on all sides by friendly agencies which might fulfil some of its purposes, why is it that our own Society still flourishes? Is it merely because of the allegiance of a membership, who, having found congenial associates and having profited in the past, continue to support the Society from a sense of loyalty? Certainly this element is an important one, but I think it is clear that this is not the whole answer, and that the Society has a mission to fulfil which must grow more important as the years pass.

It is notable that both here and abroad eminent speakers have seen fit to recognize three epochs in the development of the technique of illumination. These three have been variously described, but may roughly be outlined as, first, an era in which the subject of efficiency in production and distribution of light received a large share of attention with special emphasis on theoretical treatment; second, a period in which practical applications were worked out in detail with a growing recognition of the essential part played by æsthetic and psychological effects in lighting, and, finally, the present epoch, in which the great need seems to be education and propaganda to make the results of previous work as widely useful as possible; in brief, to "sell" illuminating engineering to the general public. Such separation into historical periods is, of course, rather arbitrary; certainly no sharp demarcation can be made between them. That all three types of activity were more or less clearly foreseen by our earliest members is indicated by the oft-quoted declaration of the aims of the Society: "the advancement of the theory and practice of illuminating engineering and the dissemination of knowledge relating thereto." Nevertheless this historical analysis is probably correct as showing the trend of development, the shifting of the centre of interest which has taken place in the Society.

Furthermore, we must grant that this shifting of interest is a natural and logical response to the needs and conditions of the times. Theoretical studies are useless unless practical application can be made of them, efficient light sources may be of doubtful value unless we know how to use them properly, and all our technical knowledge is of little avail if it remains locked up in our archives and fails to find its way through commercial channels into the lives and activities of men. There is no fault to be found, therefore, with those activities of the Society which we may class as propaganda for better lighting. So long as it appears evident that more and better lighting means profit for the man who uses it and pays the bills, as well as for the commercial interests who supply materials and service, the Society can well afford to further such propaganda. We may well labour to bring about conditions such that men may come and go in greater safety, that their energies may be used more effectively in labour, and their leisure hours be spent in greater comfort or enjoyment.

But it is just here that the need for thoroughly trained and experienced specialists arises and that the reason for the existence of our Society is emphasized. Engineering work usually deals with concrete materials. Whilst these materials are used for human welfare and comfort, yet they have tangible mechanical values of their own. The strength of a bridge, the power of a motor can be measured in mechanical units. Not so with light—it is not measurable in pounds or feet or even in watts, for power is not light except as it calls forth a human reaction. And so the illuminating engineer is up against all the complexities and vagaries of the living organism. He can not be satisfied to deliver a prescribed number of lumens per square foot at a specified cost; he must go further and know whether the effects produced on the eyes and minds of men will be satisfactory. Experience and judgment based on experience must, of course, be the largest factors in meeting such questions, but a real engineer wants a foundation of knowledge surer than that given by mere cut-and-dry experience, and the illuminating engineer must draw upon many diverse sources for this knowledge. No one man can be a physicist, a physiologist, a psychologist, an opthalmologist, an artist, architect and industrial manager, but we need some contributions from each of these. The Society has been the means by which these contributions have been brought together and fused with the practical experience gained in our own special field so as to form at least a good beginning of a scientific basis for lighting practice. We all know, however, that there is still pressing need for more of such knowledge.

As the physicist and chemist, the research and development engineer have increased the efficiency of our light sources, while progress in power production has cut

* An address presented before the Nineteenth Annual Convention of the Illuminating Engineering Society, Detroit, Michigan, September 15th, 1925.

down unit costs, light has become relatively cheap. This abundance of raw material brings new opportunities to the illuminating engineer, but it also brings new problems, and makes it still more incumbent upon us to seek the widest possible knowledge of the effects of light. We need not relax our efforts to make the results of research and experiment practically useful through commercial and industrial applications, but in the enthusiasm of "putting over" modern lighting as a commercial matter, we must not fail to give due attention also to the fundamental sciences and to the further development of the theoretical and experimental work more directly related to our own practice. It is not to be expected that detailed investigations in all the various sciences involved will be presented before our Society, but we should continue to seek the presentation of summarized reports setting forth the progress that is being made in them. This should be done both for our own information and as a means of showing our interest in these investigations and thus stimulating progress in them, for scientific work often falters for lack of an outlet where the products will be appreciated. Likewise, we should accord generous appreciation to efforts made within our own ranks to work out fundamental facts and to formulate the general principles of illumination. Each of us is busy with his own work, and we find it increasingly difficult to keep up our interest in abstruse reasoning or in tedious laboratory work for which we can see no immediate practical application. Nevertheless, we should remember that to a considerable extent our present practice has grown out of past theoretical and experimental work, and that continuing betterments in practice are most likely to be stimulated by giving a fair share of attention to the underlying principles.

And as the Society thus aims to strengthen the foundations of our engineering practice, I believe also that there would be decided advantages in recognizing in some definite way meritorious achievements in engineering. Perhaps this might be done by creating a class of membership which would require longer experience and more accomplishment specifically in the field of illumination than the present minimum qualification for full membership, which is three years' experience "in work having a direct bearing on illuminating engineering."

It would probably be advisable in this case to retain the name of "Member" for the present grade to which, of course, men working in related fields who are not engineers at all are eligible. I do not wish to discourage in the least the adhesion of any class of members who have enough interest in illumination to join us, but without doing this we might, by making distinctions between classes of members based on the kind of work they have done, help to gain a better professional standing for the Illuminating Engineer, properly so called. To be sure, there are weighty objections to this proposal and practical difficulties in determining both the requirements to be established and the men who would be chosen for such a new grade of membership. Nevertheless, if we consider the project purely from the point of view of increasing the influence of the Society and making it more useful to the lighting industry and the public, I believe a desirable solution can be found. This matter is in the hands of a special committee which may later have more definite recommendations to make to you.

Another committee has already prepared some amendments to the Constitution, of which the most important is intended to provide more direct and effective connection between the Sections and the Council through making the Chairmen of the respective Sections members of the Council. This and the other changes proposed would remedy some serious difficulties which have arisen in operating under the present Constitution. The amendments proposed appear to be reasonable and conservative, and I would bespeak favourable consideration for them.

In conclusion, I must try to express my appreciation of the unselfish spirit of service which I have found to exist among our members. The response to every call for help during the year has been so cordial that it would seem invidious to pick out individuals for specific mention, although there have been some on whom our demands must have entailed serious sacrifices of time and energy. To the officers and committee members who have carried on the business and the technical undertakings of the Society I am especially indebted; the efficiency with which the Society's central office has been conducted has also been an important asset and has relieved us of many cares. And finally, at the close of the year we come to a climax in the energy and thoroughness with which our newest section and its friends here in Detroit have set the stage for a convention which I trust will mark another step forward in the record of the Society. I know you will all join in acclaiming the hospitality of which they have already given so much evidence, and in wishing for the Michigan Section a brilliant career of service.

## The Art of Illumination

IN a recent issue of *Licht und Lampe* Dr. P. Heyck's recent paper on the above subject before the Illuminating Engineering Society in Germany is reproduced. Much of the paper is concerned with the problem how practical lighting requirements can be reconciled with the so-called "artistic aspects." It is shown, however, that in general the avoidance of conditions which are disturbing to the eye (troublesome glare, reflections from polished materials, abrupt shadows and severe contrasts in brightness of illumination) in general contribute to a harmonious and pleasing effect.

Some suggestive remarks are made in regard to local lighting—still often desirable for very exacting work. Here avoidance of undue contrast in brightness is specially desirable. The eye is wearied by the alternation of a bright working surface and very dark surroundings. But—and this is not generally appreciated—lighting may err in the opposite direction, i.e., the surroundings may be too bright in comparison with the working surface, which, though it receives a high illumination, may itself be dark in colour. Surroundings that are brighter than the object viewed tend to cause the latter to appear insufficiently illuminated. This leads the author to inquire whether the conventional method of making everything in an operating theatre white is desirable. In the desire for cleanliness, walls are painted white, attendants wear white clothes, even the floor is sometimes whitened. This surrounding brightness is not always helpful to the eye of the operating surgeon, and Professor Heller, of the St. George Hospital in Leipsic has proposed the substitution of a grey colour for floor and the lower parts of walls; also (in addition to a skylight) a single window with adjustable blinds in a position carefully selected with respect to the operating table.

The paper was illustrated by an excellent series of pictures showing various defects, such as glare, uneven illumination of ceiling from semi-indirect units, excessive darkness overhead, and shadow-effects arising from light falling on busts and statues from different directions.

## Sheffield Illumination Society

On November 18th the members of the Sheffield Illumination Society had their last lecture of the session at the Montgomery Hall, Sheffield. Mr. J. R. Hall, of the Corporation Lighting Department, lectured on "Extension and Overhead Construction," describing various methods of overhead electric street lighting. Mr. J. F. Colquhoon (Public Lighting Engineer) also referred to the many varieties of electric lanterns now available for public lighting. Councillor M. Humberstone, who presided, referred to the considerable improvements that had been made in the lighting of Sheffield under Mr. Colquhoon's supervision.

# Recommendations on Correct Street Lighting

## By a Correspondent

EVERY illuminating engineer is well aware that efficient street lighting means a better, safer and cleaner town, with enhanced property values. Within the useful range of vision a person should be able to see about him with ease and comfort: only through good lighting can night traffic be accelerated and accidents avoided. With good lighting streets can be kept clean —less abused; in fact, it reacts upon the conditions surrounding property as well as the residents themselves. Indeed, the whole question of efficient street lighting is one of extreme importance to the satisfactory working of a town's traffic by night.

In the planning of street lighting consideration should first be given to the quantity of light to be expended, the selection of suitable fixtures, and the use of the fixture in such a manner that the maximum utilization of light will be obtained from it. It is usually assumed that most of this light should be directed downwards. At present there are a number of available accessories on the market which greatly increase the downward light from most units—naturally at the expense of the upward light. But there is a danger that by so doing the actual brilliancy of the source of light may be accentuated and the brightness of the background diminished, resulting in increased contrast, with a corresponding increase in glare. Thus, although the actual illumination in foot-candles on the street is increased, " ability to see " may even be diminished. The *vital* point, therefore, is to select equipment which will give the greatest available illumination without unnecessary glare.

The first step in designing an efficient lighting system is usually to " zone " a town, i.e., to obtain a large map of the entire town, and proceed to lay out the streets in the following order:—

(a) Principal streets.
(b) Streets of a secondary nature.
(c) Principal traffic points.
(d) Traffic points of a secondary nature.
(e) Residential streets and
(f) Undeveloped sections.

An expert's advice is naturally desirable in connection with the planning of a town's lighting system.

Street lighting illuminants are now commonly specified in terms of the " lumen," the unit of flux (which is the amount of light necessary to illuminate one square foot to the intensity of one foot-candle). Such values can be related to the candle-power of the source of light, i.e., a 400 candle-power electric incandescent lamp may be regarded as yielding approximately 4,000 lumens. Similarly the bare 6·6 ampere luminous arc using the standard long-life electrode gives 13,700 lumens, and with the high-efficiency (50-50 mixture) compressed electrode 16,780 lumens. Here it may be noted that Cleveland (Ohio) is the first city in the United States to adopt lighting units equipped with 25,000 lumens (roughly 2,500 candle-power) Mazda incandescent lamps. The largest lamps previously used in street-lighting installations have been of 15,000 lumens.

Having decided upon the size of lamp and the quantity of light per foot of street to be expended, the desired spacing should at once be obtained. In this connection the writer would like to acknowledge the receipt of some interesting recommendations and suggestions from experts on the other side of the Atlantic, which is utilized in this article. The following schedule has been adopted by the District of Columbia, and may serve as a guide in the preparation of a similar table for towns in England. It is the result of an exhaustive study of street-lighting requirements by officials of the district, assisted by a committee of prominent engineers appointed for this purpose. The plans include ornamental lighting on every developed street, and also for the illumination of all highways.

| Character of Street | Lumens per Linear Foot |
|---|---|
| Pennsylvania Avenue ... ... | Special |
| Primary business streets ... ... | 275-400 |
| Secondary business streets ... ... | 135-200 |
| Outlying business streets ... ... | 125-200 |
| Primary traffic streets ... ... | 100-125 |
| Secondary traffic streets ... ... | 60- 80 |
| Residential streets ... ... ... | 25- 50 |
| Highways or outlying districts ... | 8- 10 |

In the city of Washington, and in several other cities with comprehensive plans of public lighting, the so-called " architectural family " of standards has been adopted. This means that eventually the entire city will be illuminated by standards and fixtures of uniform design, only varying in height, size and output, depending on the character of the street on which they are located. Provision is always made in the local transformers, or in the arrangement of the circuits, for a possible increase in illumination in any street by merely substituting the next larger size lamp.

In the case of Washington, the designs of both fixtures and standards had to be approved by the Commission of Fine Arts. This approval was only obtained after many conferences, first over sketches, then scale models, and finally full-size models. Therefore, the designs as approved incorporate the ideas of a group of America's greatest architects, artists and sculptors. Certainly they are worthy of consideration by a town contemplating a new system of street lighting.

Another interesting point is the question of *costs*. The total installation-cost of each type of fixture, including everything from the source of current supply to the lamp, should be calculated, and the full rate given to the one that costs the least. Others should then be rated proportionately.

Operation and maintenance should include lamp renewals, labour of cleaning and lamping, breakage of glassware and lamps, patrolling, repairs to line, standard and fixture, sub-station expense, overhead cost, and energy cost.

The daylight appearance of the standard and fixture with various backgrounds should be considered.

At night the architectural form of the fixture should be preserved. The globe or lantern should look well-filled with light from all angles. It should be a decorative luminous object, and not merely a source of light.

The general impression, as one travels or walks through a street, is important. Is the effect a cheerful one or is it depressing? Notice not only the street surface, but the background, the trees, the shrubbery, the houses and the line of lights. It takes all of these to make a street. Light thrown on the background is not necessarily wasted. It diminishes glare and increases your ability to see.

The intensity of illumination on an object can be readily measured with modern illumination-photometers, but this is not the only consideration. The light by which one *sees* is that which actually enters the eye; for it is on *this* that the brightness of the retinal image depends. (An instrument capable of registering this quantity would be of great value!) This subjective quantity of light is dependent on the diameter of the pupil of the eye and on the state of adaptation of the retina, both of which are influenced by the brilliancy of the light-sources or other bright objects in the line of vision. For this reason photometric readings on a street do not alone furnish an indication of one's ability to see, though of considerable value when properly interpreted.

A person's ability to see from various view-points suggested can only be determined after a long series of observations under different conditions of traffic and weather. Specific tests, such as the legibility of printing, or the quickness of picking up objects of various

shapes, are of some aid, but probably not so valuable as the general impressions of competent observers. One's state of mind, when making such a test, should be about the same as it would be if one was casually driving through the street, and not intent upon some particular object. In other words, the eyes should not be fixed, but allowed to wander about as much as they naturally would.

The general lighting of the street is of prime importance, but special attention should be paid to the *intersections*, for it is at these points that we have the great dangers of cross traffic. In view of the slow-moving traffic of the sidewalk, a relatively lower illumination may here be allowed. It is desirable that there be sufficient light on the fronts of houses to enable house-numbers to be read, and sufficient between houses to insure protection from criminals. Glare is not only detrimental to vision and offensive to the eye, but a source of danger. There are possibly more motor-car night accidents resulting from glare than from any other cause. Legislation on the glare from headlights is now considered. But the first step is to ensure that the public lighting is as free as possible from this defect.

Comparative tests in lighting systems should, in theory, extend over a long period of time with the equipment in all stages of depreciation due to the accumulation of dirt and lack of adjustment; but, in practice, time is not usually available for such a prolonged investigation, hence the probable depreciation of lighting units should be estimated on the basis of data available from experience of similar units in other completed installations. Some fixtures are washed by the rains, others are streaked. The less glass surfaces between the lamp filament and the street the less chance there will be for dust, soot, etc., to settle and absorb light. Fixtures equipped with reflectors and refractors are more or less sensitive to changes in the position of the light-source, depending on the nature of the device. If a change in adjustment changes the distribution of light this naturally affects the character and quality of the illumination.

In the preparation of the above illumination the writer has endeavoured to outline some of the most important characteristics involved in efficient street lighting, and he desires to acknowledge the aid of the I.G.E.C., of Schnectady, who contributed various interesting items of information.

# Public Works, Roads and Transport Congress

## Public Lighting

At the above Congress, held at the Agricultural Hall, Islington, a series of papers dealing with road problems and public lighting was read on November 24th, when a conference of local authorities was presided over by Sir Henry Maybury, Director-General of Roads, Ministry of Transport.

A paper by Mr. R. Fletcher dealt with the problem of "highway rights," and the need for fuller co-operation between the various authorities concerned in roadway upkeep and maintenance. One principle advocated was the laying, on all new arterial or town-planning roads, of service mains of all descriptions in duplicate, and at sufficient depth to ensure safety from interference during road-repair. Mr. Warner Terry discussed the same problem from a somewhat different aspect, emphasizing the rights of "sub-service users," as well as those concerned with the actual surface on which vehicles travel.

Mr. Thomas Glover read a paper on "The Use of Tar in the Construction of Roadways," a matter which was recently discussed at Wembley and commented upon in this journal.*

* *Illum. Eng.*, November, 1925. Page 308.

The paper of chief interest to our readers, however, was that by Mr. C. S. Shapley (Engineer and General Manager of the Gas Department of Leeds Corporation), on "Public Lighting by Gas."

Mr. Shapley commenced by emphasizing the obvious importance of good public lighting, in the interests of safety, order and public convenience. He mentioned that in his capacity of Lighting Engineer at Leeds he had received hundreds of letters asking for additional lighting, and many others expressing appreciation of improvements made. Main thoroughfares are usually amply illuminated from the safety standpoint. In the suburbs the same degree of illumination cannot be expected; but in many cases the grading of illumination from centre to outskirts leaves much to be desired, and the contrast is excessive. In the suburbs, omitting from consideration main roads, the usual candle-power and spacing of roads are inadequate to maintain the minimum of 0·01 foot-candle, mentioned in the well-known standard specification, described by Mr. Trotter in 1913. The sense of security varies directly with the intensity of lighting; the preservation of this sense of security and the making of night-travel easy are the two main considerations in suburban street lighting.

At a recent conference of the Institution of Public Lighting Engineers it was agreed that street lighting often does not receive the attention it deserves; there are many lighting departments under the control of people who unfortunately are not *au fait* with an elementary knowledge of illuminating engineering. Large and medium towns should have the services of a competent man, smaller cities should seek advice from an outside expert. Some authorities, in their anxiety to keep down the rates, do not realize the importance of good public lighting. Good lighting costs money. But since the introduction of improved lighting in Leeds the police force has been reduced, and this has been made possible by a progressive Finance Committee having granted the necessary lighting rate. The feeling of security and peace of mind brought to the citizens of a well-lighted town cannot be valued in terms of money.

Mr. Shapley then gave a brief history of gas lighting from the time when London was first lighted by flat-flame burners, mentioning the introduction of inverted mantles as a great advance, and the recent progress in superheated cluster low-pressure lamps as notable advances. Lamps fitted with the smaller mantles, giving 60 to 80 candle-power, are suitable for lighting side-streets or busy centres of traffic, and lamps using clusters of such mantles and giving up to 2,000 candle-power are now on the market.

The latter part of the paper was devoted to a review of methods of automatic control, clockwork and pressure-wave controllers being in turn considered. In Leeds all main arterial roads are being "clocked," and over 5,000 such controllers were in use. One man could attend to 160 lamps in a clock-controlled district. In Leeds one portion of the distribution system is also operated by pressure-wave controllers, some 3,000 of which are in use. Here again one man can attend to 160 lamps, as compared with 100 hand-lighted.

The discussion turned largely on the details of various methods of automatic control, and several speakers inquired why the central suspension of gas lamps over the centre of the street was not more frequently adopted. Mr. Shapley, in reply, mentioned that all the centre of Leeds was lighted on this system, which could be carried out by gas as readily as by electricity. He also gave further particulars of the methods of attending to lamps, mentioning that the usage in Leeds was slightly under six mantles per nozzle per annum. Leeds never grumbled at the cost of lighting, although this was equal to an 8d. rate, because they got good service. It had been said that lighting must be made to fit the price, but the correct principle was to have efficient public lighting first, for good lighting could not be valued in terms of money.

# POPULAR & TRADE SECTION

COMPRISING

**Installation Topics—Hygiene and Safety—Data for Contractors—Hints to Consumers**

*(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)*

## Developments in Lamps and Lighting Appliances

### Some Exhibits at the Opening Meeting of the Illuminating Engineering Society on November 26th, 1925

AT the opening meeting of the Illuminating Engineering Society on November 26th, 1925, there was, as usual, a varied display of exhibits, which included new arc lamps, colour-projectors, headlights, photometric apparatus and various lighting fittings.

THE "DIA" LONG-BURNING FLAME ARC LAMP.

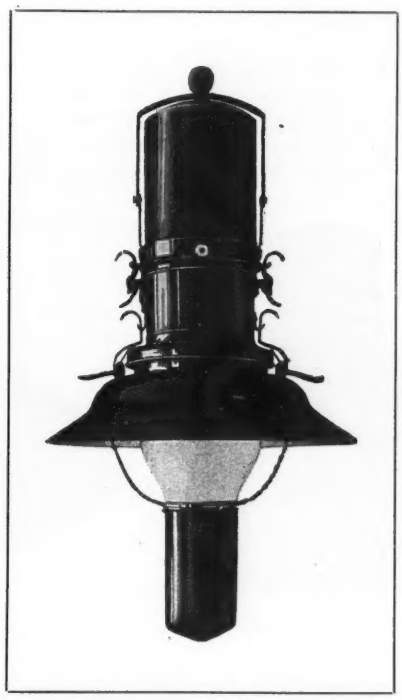
The first item on the programme was the demonstration, by Captain Risch, of the new "Dia" long-burning flame arc lamp, which was described in our issue of September last.* The lamp was suspended from the dome of the lecture theatre at the Royal Society of Arts, and was left burning during the first part of the proceedings. The chief feature of the lamp, it may be recalled, is the method of enclosing the arc in a specially designed and almost completely sealed inner globe. The space between the outer globe and this inner receptacle helps to maintain the latter at a constant high temperature, with the result that there is no material deposit of fumes over the light-giving region; the fumes are deposited in the cooler upper chamber and the lower part of the globe within the metal casing.

The lamp is stated to work at 0·22 to 0·18 watts per candle (hemispherical), according to the current consumed, and the available candle-power, according to amperage, is 2,000 to 3,600. The chief advantage of the lamp, however, is the long burning period—not less than 120 hours for a single pair of carbons, and it is stated that the process of recarboning and cleaning the globe only occupies a quarter of an hour.

As recently mentioned in this journal, the lamp has been developed in the laboratories of Messrs. Körting & Mathiesen (Leipsic), and it is stated that about 400-500 of them are already in use in the streets of Berlin. In this country the lamp is on view in the showrooms of the Photector Co. Ltd., and a number of them are now to be seen in London—there are several in use outside the Coliseum. Experiments are also being made with the lamps in Wolverhampton, Glasgow, Edinburgh, Dublin, Newcastle-on-Tyne and other cities.

A NEW INTEGRATING PHOTOMETER.

THE new integrating photometer, exhibited by Lieut-Colonel Kenelm Edgcumbe at the meeting, has also been described already in this journal. It utilizes a 2 ft. 9 in. Sumpner cube, which is rendered more accurate by having the corners cut away. This can be applied in conjunction with a photometer bar in the ordinary way, but in order to economize space a self-contained arrangement has been devised. The photometric field consists of a Lummer-Brodhun prism, one element being illuminated by the interior of the cube (which contains the lamp under test), the other by a separate window opening on an enclosure containing the comparison lamp, the distance of which is adjustable. The whole forms a convenient and compact device, and for fuller details readers are referred to the description in our February number. (Pages 49-50.)

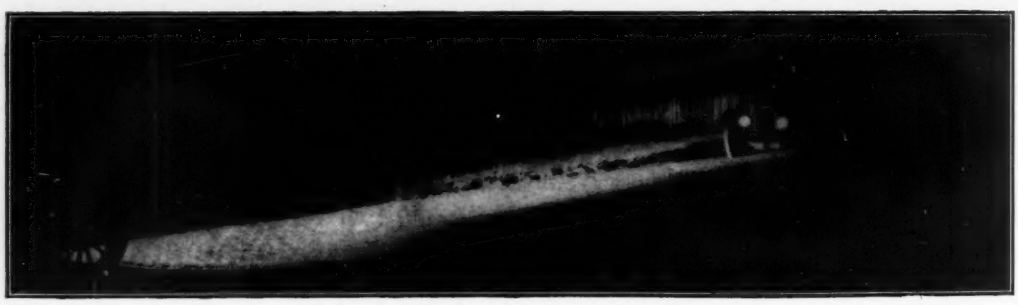


General Appearance of "Dia" Long-burning Enclosed Flame Arc Lamp.

OSRAM ANTI-DAZZLE LAMPS FOR HEADLIGHTS.

Mr. T. J. SACK (General Electric Co. Ltd.) demonstrated the use of the above device, which consists of an ordinary standard Osram automobile lamp with the top half coated with a yellow translucent china clay pigment (this being the only known material which will withstand the high temperature of the gasfilled lamp). The effect is to produce a beam divided transversely into two portions. The full driving light is obtained on the road from the lower half of the beam. The upper half of the beam, however, consists of yellow diffused light, so that glare in the eyes of approaching drivers and pedestrians is avoided.

* *Illum. Engineer*, September, 1925. Page 254.



Osram Anti-Dazzle Lamps for Headlights.

For the purpose of comparison two standard C.A.V. headlights were fitted up side by side, one containing a 12-volt 24-watt Osram anti-dazzle lamp, the other an ordinary automobile lamp of similar type and wattage, but having a clear bulb. The difference in effect, when the beams were projected on to a white wall, was quite striking, and it was shown that the intensity of light in the lower half of the beam (the driving light) was the same in both cases.

The above illustration is reproduced from an untouched photograph with the object of showing the effect. The car on the left is fitted with the special colour-sprayed lamp, and the " cut-off " thus produced is clearly seen along the fence at the side of the road. The head of the approaching car is in the diffused region of the beam, and it has been found that this diffused yellow light is very useful to motorists, especially during a fog.

Every " M.V." Reflector is made with an adjustable neck. Two metal collars can be pulled out or pushed in, lowering or raising the reflector relative to the lamp. Thus they are suitable for Cosmos gasfilled lamps of either 60 watts, 75 watts, 100 or 150 watts (the two last-named having equal light centre length) with the gallery supplied.

Three types of " M.V." Reflectors are made:—

1. Type E5 projects the light vertically downwards, and should be used at the back of deep windows to supplement types E2 and E4. Also for showcase lighting, etc.

2. Type E4 projects the light more backwards than type E2, and should be used where the depth of the window is greater than half the height.

Fig. 1.—" M.V." Reflector, Type E5.

Fig. 2.—" M.V." Reflector, Type E4.

Fig. 3.—" M.V." Reflector, Type E2.

It was mentioned that these lamps had been submitted to the R.A.C. for test, and their certificate (No. 606) shows that the driving lamp is unimpaired and the side-illumination considerably improved by the use of these lamps. They can be fitted to any form of headlight, and involve no alteration in the wiring of the car, nor is any attention from the driver necessary once the lamps have been fitted. The extra cost of the lamps due to the colour spraying is only 9d., and they are considered the cheapest anti-dazzle device yet introduced. It is stated that, following extensive trials of various anti-dazzle devices, these lamps have been adopted as a standard fitment by the Birmingham Corporation buses.

## Shop-Lighting Reflectors, &c.

*" M.V." Reflectors.*

Mr. H. H. Long (Metro-Vick Supplies Ltd.) exhibited a series of " M.V." Reflectors, which are all metal, pressed from pure silver sheet, coated electrolytically on the outside with pure copper. They are, therefore, unbreakable, lighter than glass reflectors, and guaranteed not to crack or peel.

3. Type E2 projects light downwards and slightly backwards, and should be used where the depth of the window is less than half the height.

*" M.V." Colour-Screens.*

The next item shown was the " M.V." Colour-Screens. These are considered very simple in construction, and safe and effective in use. Four gelatine films are supplied with each screen; one each red, green, blue and amber.

The frame is made in two parts:—

1. The outer ring, which is fitted with two lips which hook on to the back of the " M.V." Reflector lip, and a gallery screw which engages with the front of the lip.

2. The inner ring, which drops into the outer ring and holds the gelatine in place.

Fig. 4.—" M.V." Colour-Screen.

FIG. 5.—M.V. "Silverstone" Fitting.

*"M.V." Silverstone Fittings.*

"M.V." Silverstone Fittings are recommended as eminently suitable for use in shops, offices and public buildings for general illumination. They are totally enclosed and dust-proof. The glassware is made in a variety of shapes for different distributions of light. This glass, while giving perfect diffusion of light and completely obscuring the source, has a very low absorption ratio.

*"M.V." Decorated Units.*

For Better Home Lighting, the "M.V." Decorated Units have been introduced. Whilst retaining the good utilitarian qualities of the "M.V." Silverstone Fittings, they are decorated with pleasing designs in harmonizing colours. They should be instrumental in introducing better lighting in the home.

ZEISS REFLECTOR LAMPS.

Mr. ARTHUR J. DALLADAY (J. W. Atha & Co.) exhibited the Zeiss Reflector Lamps, of which two models were shown. These have been introduced by Messrs. Carl Zeiss, Jena, as efficient units specially applicable in the field of industrial lighting.

In some cases efficiency is apt to be sacrified in an effort to obtain a pleasing effect. The Zeiss Reflector Lamps accomplish this object without loss of efficiency. They have been designed with the object of utilizing effectively the whole of the light, and, in addition, reproducing accurately a distribution curve which is adjustable within fairly wide limits.

They fall into two classes. The first class employs a silvered glass mirror optically worked to a paraboloid surface. The lamp may be focussed relative to the mirror, thus giving more or less intense concentration. In this type the distribution curve is steep, the maximum downward intensity, using a 100-watt gasfilled bulb, reaching 1,200 candle-power. In the model shown in Fig. 1 most of the light is concentrated within an angle of 90°; the intensity at 65° with the vertical is about 100 candle-power. On the other hand, the ground-glass front gives sufficient general illumination for all ordinary purposes, such as the lighting of offices, showrooms and shop windows.

FIG 1.—Type C7.

A recent addition to this class was demonstrated (Fig. 2), wherein the glass front is much larger and the upper portion encased in opal glass. The resulting distribution curve is similar, but a greater proportion of light is diffused over a wide angle. The maximum downward intensity is correspondingly reduced to about 1,000 candle-power. This type is preferable for situations in which an appreciable illumination of the ceiling is desired.

The other class of Zeiss Reflector, known as the Bell Reflector, is illustrated in Fig. 3. Here, again, the reflector is of silvered glass, but in this case consists of a number of stepped parabolic sections. The resulting distribution curve is extremely flat over an angle of about 150°. The vertical intensity with a 100-watt bulb is, when focussed for greatest diffusion, about 200 candle-power, and at 50° with the vertical 250 candle-power. When adjusted for greatest concentration, the vertical illumination is increased to 350 candle-power at the expense of the flatness, the intensity at 40° being 250 candle-power, and at 50° 100 candle-power. These lamps can be fitted with a front glass, which removes all glare, and at the same time provides a certain amount of widely diffused light.

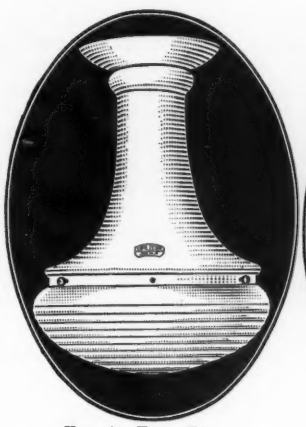


FIG. 2.—Type C9.

FIG. 3.—Type J240.

FIG. 5A.—Decorated Urn Fitting.

The Bell Reflectors form a more recent introduction than the paraboloid reflectors, and have been designed with a view to cheapness. They have proved extremely valuable for all classes of industrial lighting where the first consideration is not elaborate design. They are neat, but not decorative, and a wide range has been provided—from the small reflector for lighting single machines to the weather-proof outdoor lantern taking 1,000-watt bulbs. In all cases, however, the main features are the same—exceedingly high efficiency and widely adjustable distribution.

BENJAMIN SPECIALITIES.

Mr. R. E. IVES (The Benjamin Electric Ltd.) then showed a series of lighting units embodying various novel features.

*New Street Lighting Fitting.*

The first fitting shown was primarily designed for street lighting, and is called the Rodalux. It is substantially made of vitreous enamelled steel, the reflecting surface being clear white vitreous; the exterior finish is of black vitreous enamel. The fittings are equipped with a cast-iron weatherproof flange, which is specially designed to allow complete ventilation for the lamp and lampholder; another special feature is the easy wiring device.

FIG. 1.—Rodalux Street Lighting Unit.

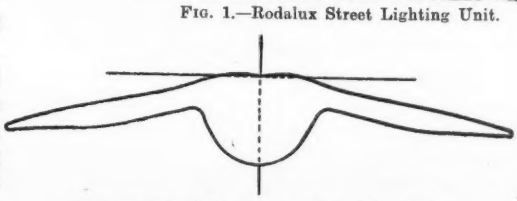


FIG. 2.—Distribution Curve of Rodalux Unit.

FIG. 3.

Fig. 1 gives an illustration of the fitting, and Fig. 2 the characteristic light distribution curve in the vertical plane through the major axis. Fig. 3 shows the characteristic light distribution curve of Rodalux unit in the vertical plane through the minor axis.

The spacing ratio is in accordance with modern street-lighting practice, the distribution of the fitting being such as to allow a spacing ratio of nine times the mounting height.

Apart from street lighting, this Rodalux Fitting is particularly suitable for the lighting of wharves, docks, railway goods yards and platforms, carriage drives, etc. In such installations a lower diversity factor must be allowed for than in street lighting, and the spacing ratio should, therefore, be 4½ to 6 times the mounting height.

*Biflector Fittings.*

A further development of the Biflector Fitting shown at the opening meeting of the Illuminating Engineering Society on November 18th, 1924, was exhibited. The


Fig. 4.—Biflector Fitting.

design of this new lighting unit is based on the correct optical combination of two reflectors, an upper and a lower one. The effect of the combination is such that absorption is reduced to a minimum, and a highly efficient distribution of light is obtained with freedom from glare.

Fig. 4 is an illustration of the Biflector Fitting, which is made of vitreous enamelled steel, having a pure white reflecting surface and green exterior finish. It is equipped with a porcelain lampholder, has a detachable weatherproof flange, and is provided with efficient ventilation and an easy wiring attachment. These lighting units are made in sizes suitable to cover the whole range of standard gasfilled lamps. The correct spacing ratio for the Biflector Fitting is 1 to 1⅔.

*Elliptical Angle Biflector.*

A still further development of the Biflector Lighting Unit, which embodies similar optical principles in the design, is shown in Fig. 5.

It will be seen that an inner reflector, which is made in the form of a semi-cylinder with a suitable optical contour, is located in the main angle reflector, thus forming a combination which gives maximum lighting efficiency with entire freedom from glare. The fitting is made of vitreous enamelled steel, all reflecting surfaces being pure white.

The angle Biflector has been evolved to satisfy the demand in industrial lighting installations where it is essential to illuminate the interior from the side of the building, owing to overhead obstruction, such as travelling cranes, etc. Under certain conditions, ordinary angle-type reflectors would leave the lamps exposed, thus causing glare, particularly if the fittings were at a low elevation. The Elliptical Angle Biflector meets the difficulty, overcoming this inherent defect of side-lighting, and has also a high utilization efficiency.

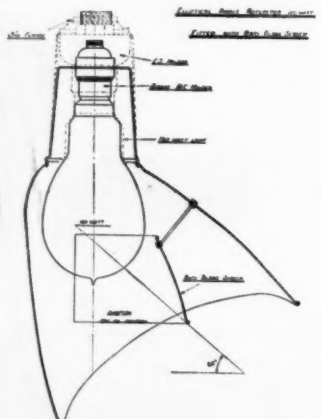


Fig. 5.—Elliptical Angle Biflector.

The spacing ratio for these fittings is 1 to 1½ times the mounting height.

*Artificial Daylight Unit.*

A daylight unit for colour matching was next shown, which has been designed to give a light closely approximating to daylight.

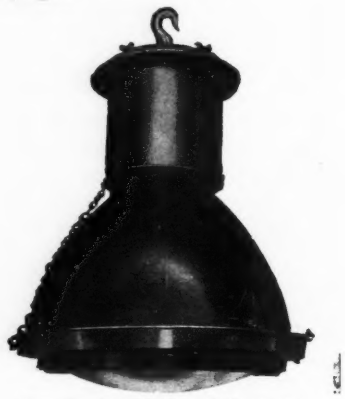


Fig. 6.—Artificial Daylight Unit.

The fitting is shown in Fig. 6, and has a very neat appearance, the reflector being made of vitreous enamelled steel, the reflecting surface being white, and the exterior finish black. The light filter is made in the form of a shallow bowl, which is attached to the reflector by means of a removable carrier. Special means have been provided to allow ample ventilation of the fitting. This type of Daylight Unit is being supplied to many industries, such as dyeworks, printing works, textile industries, clothing stores, and the like, where a true discrimination of colours is required.

*Screened Shop-Window Reflector.*

Difficulty has been experienced in shop-window lighting equipment to protect the eyes of the onlookers from the glare of the lamps. This particularly applies to island windows and arcades where long rows of brilliant lamps may be in the line of vision, detracting from the appearance of the windows, and spoiling the effectiveness of the display to the onlooker.

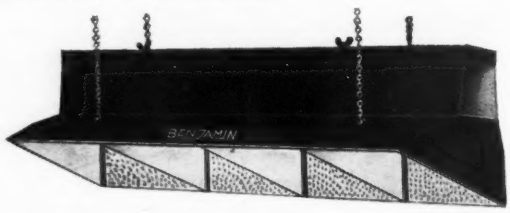



Fig. 7.—Trough Reflector for Shop-window Lighting.

Fig. 7 shows a trough reflector, specially designed to prevent the light from the lamps coming into the direct line of vision. The troughs are equipped with opal glass screens, placed between each lamp, thus ensuring that the actual light source is effectually concealed from view. By an ingenious device it is possible to remove the screens or mirror for cleaning purposes, and to reassemble with the greatest ease.

*Shop Window Elliptical Angle Reflectors.*

The next fitting, illustrated in Fig. 8, shows a novel type of shop-window reflector, which is made of vitreous enamelled steel. The optical characteristics are such that maximum intensities for the lateral spread are maintained over an angle of 60°, that is 30° either side of the vertical axis in a horizontal plane, whilst the maximum intensities obtained in the vertical plane are between 30° and 75°.

The units, therefore, project the light well forward in a vertical plane, and in addition spread the beam in a horizontal direction. They are eminently satisfactory for shop-window lighting, ensuring a uniform distribution of light with economical cost of installation and maintenance. The units are adapted to take a standard

Fig. 8.—Shop-window Elliptical Angle Reflector.

B.C. holder, and can be fixed by means of batten holders or suitable brackets to the ceiling or transom of the window.

*Anti-Swinging Device.*

An interesting device, specially designed for use with street-lighting fittings, was next shown, the object being to provide means to minimize or reduce swinging of the fittings, and at the same time allowing sufficient movement to prevent strain on the main suspension. In the case of lamps supported at a height above the ground the lighting unit is often hung from a hook or ring, and in a strong wind the swinging action causes considerable wear on the suspension hook, or part which engages, and the lamp thereby becomes dangerous. Furthermore, such swinging gives the light beam undesirable corre-

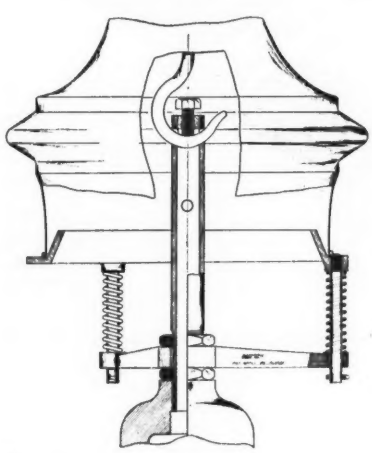


Fig. 9.—Anti-Swinging Device.

sponding motion. A sectional elevation of the device, showing its application to a special canopy, which is equipped with standard trip gear and slip-ring electrical contacts, is shown on Fig. 9.

The top portion of the cast canopy of the lighting unit is shown attached to the anti-swinging device, having a central supporting nipple which engages the main suspension hook. The steadying device comprises a three-armed spider, with springs interposed between the lighting unit and a canopy or fixed support. This anti-swinging device has been proved extremely efficient when applied to street-lighting fittings in practice.

*Portable Hand Lamp.*

A very neat form of shock-proof portable hand lamp was next shown, which embodied several novel features. A view of this is shown in Fig. 10.

This comprises an ebonized handle equipped with a convenient push-switch and suspension loop. The unbreakable fibre guard is of unique design, with which is incorporated an Anti-glare Light Reflector. Special spring clips are provided, which engage the lamp bulb, thus keeping it perfectly steady under all conditions of services. The hand lamp is equally suitable for vacuum or gas-filled lamps up to the 60-watt sizes.

Fig. 10.
Portable Hand Lamp.

*Portable Dim-a-Lamp.*

In conclusion, a Portable Dim-a-Lamp was shown, of which an illustration is given in Fig. 11.

This fitting is well designed and finished, and is equipped with a clamping adjustment, so that it is

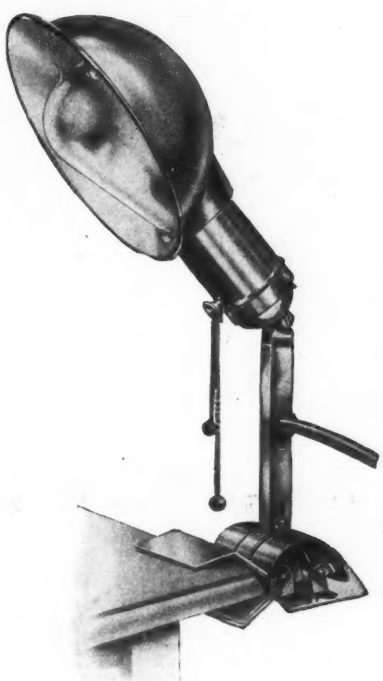


Fig. 11.—Portable Dim-a-Lamp.

possible to fix the fitting in almost any desired position. The pull-chain attachment for dimming the light is very simple to operate; the device is specially applicable at the bedside, and in the nursery, hospitals, etc. For office desk-lighting the Portable Dim-a-Lamp has also special advantages.

AUTOMATIC CONTROL OF GAS AND ELECTRIC LAMPS.

Mr. E. H. HORSTMANN, of the Horstmann Gear Co. Ltd., demonstrated a series of automatic clockwork devices for controlling both gas and electric lighting.

At the moment of going to press we have received from Mr. Horstmann a complete illustrated description of these devices, which will appear in our next issue.

It is interesting to note that the first known application of clockwork controllers was in connection with the illumination of church clock dials by gas.

# The Mutochrome

View showing Ten-Colour Mutochrome, Box of Filters, Photographic Slide containing Negative, Dark Slide and Lens Caps.

THIS ingenious device, which was recently exhibited by Mr. L. C. Martin at one of the lectures on Illuminating Engineering at the Polytechnic,* was shown by Mr. S. H. Groom.

This instrument is essentially an apparatus for the study of the colouration of decorative designs, and the above illustration gives an idea of its construction, the projecting lenses, the box of colour-filters, etc., all being shown. In dealing with a design, tracings or impressions in black on white are first made of each individual element, and these are photographed in succession by the series of concentric lenses. When the negative is placed in position the instrument operates like a lantern, all these various individual patterns being projected on to a screen and dovetailing into one another. The component images are thus projected through the series of lenses, each of which is equipped with an iris diaphragm, in front of which any desired colour-filter may be fitted and held by means of a spring.

It is thus possible to alter at will both the colour and the intensity of any component image, and Mr. Groom demonstrated at the meeting the wide variety in appearance that can be produced. The most striking thing is the simplicity of the apparatus, each photograph being automatically reproduced on the screen in its correct position.

The apparatus should be useful to all industries concerned with coloured patterns, such as wallpapers, printed fabrics, etc. The picture can be viewed by a number of people simultaneously, and the design modified until the correct effect is obtained. It is also possible that, in a larger form, the apparatus will prove useful for the projection and building up of scenery on the stage, as colours in the design can be altered at will, or an entirely new scene built up quite expeditiously.

* *Illum. Eng.*, May, 1925. Page 126.

# The Lighting of a Famous Minster

## New System of Illumination in Peterborough Cathedral

FIG. 1.—View of Nave from west end, by artificial light; taken during evening recital.

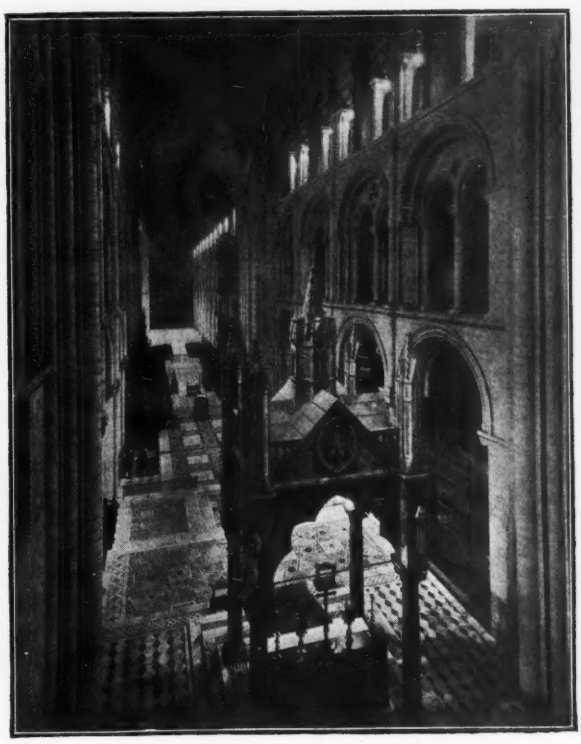


FIG. 2.—View from east end (Triforium level); taken by artificial light.

THE ancient Cathedral Church of Peterborough is now lighted by electricity. Peterborough Cathedral was built about 800 years ago, and although parts of the fabric are more recent, the interior is almost pure Norman.

The new lighting system was formally inaugurated on October 4th, 1925. On November 26th a special visit of the press to inspect this interesting installation was arranged. Our representative was very favourably impressed with the general scheme, which exemplifies the true functions of lighting fittings in buildings of distinction—to reveal the surroundings and architectural features, rather than to exhibit their own glories. The application of this idea is well shown in Figs. 1, 2 and 3.

Owing to the fact that the lighting units for the most part are situated on either side of the Clerestory windows, the light is in respect of direction and distribution similar to daylight. Shadows are few, and are of the depth and distribution of those cast by the sun. One notable effect of the new lighting is the manner in which it reveals and emphasizes the architectural and decorative features of the interior. Formerly these could not be seen at all at night. Now the whole Cathedral is suffused with a light which illuminates the beautifully carved roof as well as the famous mosaic pavement. A comparison of the photographs taken by daylight and by the new electric lighting illustrates the close similarity which exists between the natural and artificial illumination. Figs. 6 and 7 showing the choir and chancel by natural and artificial light, are particularly instructive in this respect.

Indeed some might consider that the effect by artificial lighting is more striking than the appearance during the day; in view of the very variable and fluctuating nature of daylight, it is probable that on the whole the details of the interior will be more easily seen in the evening, when artificial light is used.

### THE ORIGIN OF THE SCHEME.

Early in 1924 the Dean and Chapter requested Mr. H. A. Nevill, the Peterborough City Electrical Engineer, to submit proposals for the illumination of the Cathedral by means of electricity.

FIG. 3.—View of Retrochoir; taken by artificial light.

After collaboration with the Illuminating Department of the British Thomson-Houston Co. Ltd., Mr. Nevill submitted a proposal to the Dean and Chapter in August. This scheme was carefully considered, and as it appeared likely to meet the requirements of the case it was arranged to install a small trial installation so that the actual effect could be judged. This trial installation was duly completed in December and was considered generally satisfactory, although a few minor alterations were made in the position of the lighting units to meet the views of the Cathedral architect. Finally, the proposals for the lighting of the Nave, Choir, Chancel and Transepts were approved on the basis of the trial installation, and this scheme was eventually completed and inaugurated on Sunday, 4th October, 1925.

The Cathedral has a cruciform ground plan, consisting of Nave, two Aisles, Chancel and Transepts. The Chancel, Nave and Transepts have each three stages, namely, Arcading, Triforium and Clerestory.

The greater portion of the lighting is effected by units placed on either side of the Clerestory windows —so that the artificial light comes from practically the same direction as the daylight, and the units, being placed at a considerable height above the floor, are beyond the normal angle of vision. Furthermore, as they are fixed in recesses, they are practically concealed from view up and down the length of the building. The units are suitably grouped together, and controlled by contactor switches placed in the Triforium in the north and south Transepts. These contactors in turn are controlled by push-button panels placed immediately behind the Choir Stalls on the south side. The contactor panels on the north and south sides respectively are fed from the two sides of a 400-volt, 3-wire, direct current supply from the Corporation Electricity Works.

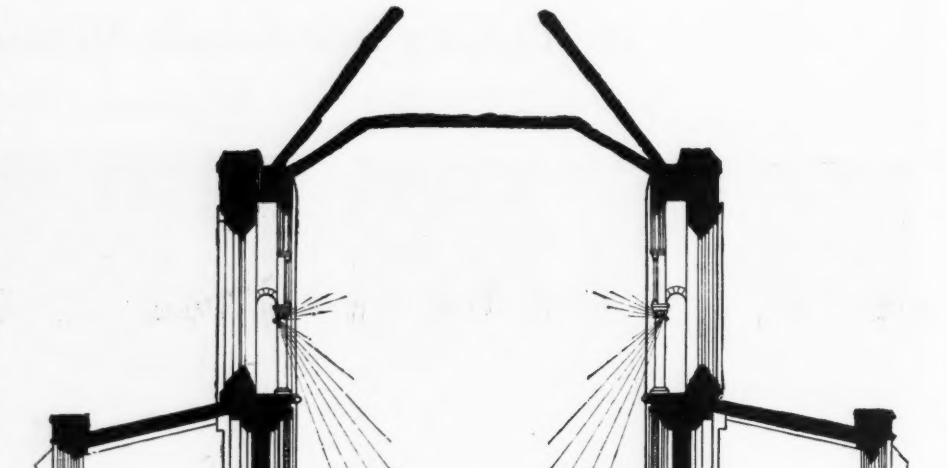


FIG. 4.—Transverse Section through Nave, showing arrangement of B.T.H. Lighting Units.




FIG. 5.—Curve showing theoretical distribution and intensity of illumination on floor level.

In Figs. 4 and 5 the positions of lighting units and the resultant illumination are shown. It will be observed that a total of about 2·5 foot-candles is provided.

### SPECIAL LIGHTING UNITS.

Each lighting unit consists of a specially designed projector comprising three silvered glass mirrors mounted in a suitable case, and equipped with a 250-watt projector-type Mazda gasfilled lamp. The lamp is supported in a porcelain holder mounted on an adjustable bracket, so as to permit of its being correctly focussed in relation to two of the mirrors, the third mirror being itself adjustable.

The projector itself is mounted on an adjustable arm, which in turn slides on a bracket attached to the wall of the building. This bracket is jointed, so that by releasing a screw the complete projector can be swung into a position whence it can be easily reached from the walk which runs round the Clerestory, for cleaning, etc., without the use of ladders or scaffolding.

The beams from these projectors are trained diagonally downwards across the Cathedral towards the bottom of the piers on the other side of the Nave. The portion of the beams, which would otherwise be spilt on the edge of the Clerestory, is deflected upwards to illuminate the upper part of the walls and roof.

Different arrangements were necessary at the "crossing" beneath the central lantern tower. Here eight special units are mounted nearly 100 feet above the floor. Each of these units is provided with a single silvered glass reflector, and a device to prevent the light "splashing" on the walls in the upper part of the tower. These units are supported on tubular arms, which are carried from a pivot attached to the wall of the building, and are provided with a counterbalance weight so that the units themselves, which project some considerable

distance beyond the masonry, can not only be swung round to an accessible position for cleaning, but can also be adjusted in all directions from this position.

The lighting at the eastern end of the Apse, and certain other situations, is effected by Mirolux Trough Reflectors fixed in a suitable position in the Triforium and Clerestory.

All the lighting units are finished in light buff tint, matching the colour of the walls, so as to render them as inconspicuous as possible.

Perhaps the most effective portions of the lighting are the illumination of the Main Entrance and the Nave; for the former flood-lights, sunk below the pavement level and massing the light on the vaulting, have been installed. At the same time the steps are so illuminated as to be as distinctly seen as by daylight. As remarked at the beginning of the article, the general aim has been to supply during the hours of darkness conditions generally resembling those existing in sunlight. Hence lighting units are concealed from view so far as possible, and, as the photographs show, there is a clear view throughout the building, uninterrupted by anything in the nature of glare. In the Dean's Vestry in the North Aisle, however, decorative lighting fittings in keeping with the surroundings have been installed.

The electric supply enters the building at the ends of the north and south Transepts, where the main switches, meters, etc., are situated, and passes thence, by means of lead-covered cable, up the staircase at the end of the Transepts, to the control panels, which are situated at the extreme north and south ends of the east side of the Transepts on the Triforium level. From these points lead-covered cables run up the staircase to the Clerestory level to their respective units.

FIG. 6.—Choir and Chancel by daylight.

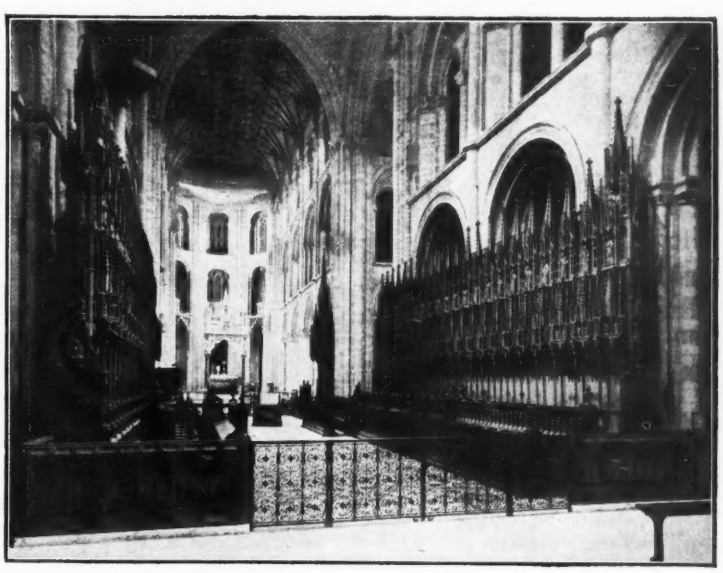


FIG. 7.—Choir and Chancel by artificial light.

### HOW THE LIGHTING IS CONTROLLED.

The control cables from the push-button boards (which, as already stated, are situated at the west end of the south side of the Choir Stalls) run through the crypt to the staircase at the south end of the south Transept, whence they pass up to the Triforium—one directly to the control panel in the south Transept, and the other round the Apse to the control panel in the north Transept. Each of these cables contains no less than 37 conductors, and 16 pairs of push-buttons are provided on each control board to bring on or take off the lights in a variety of groupings. Each control panel is provided with 15 contactors, and each contactor circuit is furnished with a no-voltage and overload release. The panels are contained in well-ventilated sheet steel cases mounted on concrete.

So much for the main body of the Cathedral. Special wall lanterns are employed for the illumination of the Vestries, and the entrance in the West Porch is lighted by means of units secreted in the paving. The light from these units is thrown upwards on to the vaulting, whence it is diffused over the entrance to the West Doors. Special arrangements are employed to prevent the lamps from being seen in passing from the Porch to the Cathedral, or vice versa.

The same care which characterizes the design and arrangement of the lighting units has been expended on the wiring, the cable runs being carefully executed throughout the building. Most of the cables are in positions where they cannot be seen by the congregation. We understand that, considering the magnitude of the scheme, the entire cost has been kept within very moderate limits.

As previously stated, Mr. Nevill, the City Electrical Engineer, has acted as consultant to the Cathedral authorities, and is to be congratulated, not only on the installation generally, but also on the manner in which he has reconciled and harmonized the various engineering, constructional and architectural factors so that they form a homogeneous whole.

The British Thomson-Houston Co. Ltd. were responsible for the design of the installation and the manufacture of the lighting units and Mazda lamps, and Messrs. Amies & Sons, the local contractors, for the wiring and erection of the gear.

## An Electric "Through-Street" Signal

According to *The Electrical World*, the Chicago City Council has appropriated 125,000 dollars from the vehicle tax fund for the purpose of installing street and warning signs at the intersection of through streets. After trials with about 20 forms of apparatus an illuminated sign, in the form of a shield with a lighted lens in the centre, has been adopted as the standard. A total of 665 of these signs has been installed, at a cost of 123 dollars each. The upkeep is undertaken by the street-lighting organization.

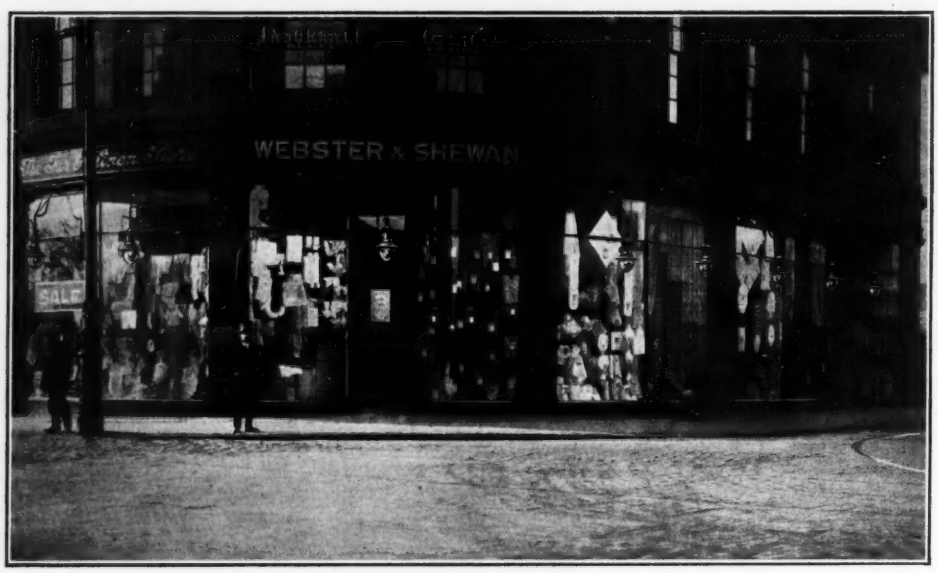



FIG. 1.—An installation of twelve of the latest type High-pressure Gas Lamps outside a draper's shop in the North of England. The special heat-resisting glass globes of these lamps have now been in use for two lighting seasons, and not one of them has been cracked or damaged.

# High-Pressure Gas Lighting

HIGH-PRESSURE gas lamps and burners are being increasingly used for the lighting of public thoroughfares, shop fronts and parades, railway stations and sidings, factories and workshops, and public buildings, because this system ensures a very high candle-power from the gas consumed. The manufacturers of one of the best-known systems of high-pressure gas lighting claim as high an efficiency as 60 candles per cubic foot of 500 B.T.U. gas.

Although in these days this form of gas lighting is so extensively employed, it may not be amiss to give a brief description of the principles of the system. The pressure of ordinary town's gas is increased to 80 in. water column by means of a compressor of the rotary type, and then supplied to inverted lamps specially designed and constructed for use with gas at the highest pressure. The gas issuing from the nipple at high velocity causes a large volume of air to be drawn in to complete combustion, and the result is a particularly intense or concentrated flame which, in conjunction with the mantle, gives the highest efficiency it has yet been found possible to obtain. The light is white, brilliant, and absolutely steady, and when the most suitable units are placed in correct positions they do not try the eyes of indoor workers, even when in some cases no globes are used to protect the mantles.

The necessity for installing and running a compressor with high-pressure gas lighting is not an objection from the broad point of view of cost, as the saving effected in gas consumption soon pays for the initial outlay on the compressor; and the power required to drive the small machine is almost a negligible factor.

## OUTSIDE LIGHTING.

While high-pressure gas lighting gives such excellent results in candle-power for a given gas consumption, there is another important point that must not be lost sight of when considering this or any other method of artificial illumination, namely, the cost of maintenance. Maintenance costs have never been a very serious item with high-pressure gas lighting, but in this connection it may be mentioned that high-pressure gas lighting has recently received a considerable fillip, due to the fact that the size of lamp for a given candle-power has now been considerably reduced; that is to say, a lamp of a size which would formerly accommodate only a 750 candle-power burner and mantle will now accommodate a 1,500 candle-power burner and mantle. This has been made possible through the introduction by a leading firm of high-pressure gas lighting specialists of a special spherical super-heat-resisting glass globe.

Fig. 1 shows an installation of these latest types of high-pressure gas lamps, fitted with small globes and fixed outside a draper's shop in the north of England. During two lighting seasons every one of the original globes has remained intact, in spite of the fact that a higher candle-power burner and mantle are enclosed in the smaller lamp; that is to say, a 1,500 candle-power unit instead of one of 750 candle-power.

Fig. 2 indicates the relative size of the older and newer lamps. The main advantages of the new lamp, summarized briefly, are lower initial cost, much less room taken up by the lamp, and lower maintenance charges.

High-pressure gas lamps are being increasingly used for the lighting of the exteriors of cinemas. Cinema proprietors have not been slow in discovering that just as a well-lighted shop front or shop parade attracts customers and increases business, so a brilliantly lighted cinema front attracts patrons and sends up the box-office receipts. The fact that so many cinema proprietors have adopted high-pressure gas to ensure brilliantly lighted exteriors is a fine tribute not only to the efficiency but to the economy of the system; for in this business running costs have to be carefully and continuously scrutinized.

FIG. 2.—This illustration shows the relative sizes of the new and the old 1,500 c.p. "Keith" Lamps.

Where directional lighting is required, such as for facia and sign illumination, special reflectors are, of course, provided for directing the light in the desired direction. (See Fig. 3.)

Among the many cinemas where high-pressure gas has been adopted for outside

FIG. 3.—The exterior of Euston Market, Euston Road, London, N., is lighted by a series of powerful High-pressure Gas Lamps fitted with screens which direct the light on to the advertisements placed in panels on the walls.

lighting may be mentioned the following typical examples:—

The Brixton Palladium, Brixton Hill, S.W.

The Broadway Cinema, Deptford.

The Central Hall Picture House, Bushey Green, Catford, S.E.

The "Golden Domes" Cinema, Denmark Hill.

The "Golden Domes" Picture Theatre, High Road, Streatham.

"The Palladium," Brockley.

"The Picture House," King's Road, Chelsea.

The cost of installing a high-pressure gas installation for all kinds of lighting requirements other than domestic is reasonable, and it may here be mentioned that in many cases existing gas piping can be utilized for the gas at higher pressure. For brilliant outside lighting the efficiency obtained with high-pressure gas makes the employment of high-power units an economical proposition.

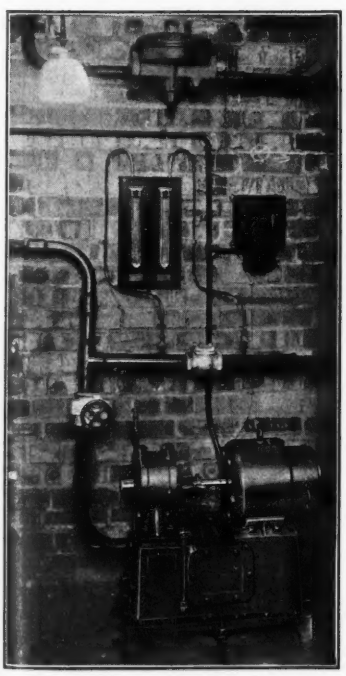


FIG. 4.—The small plant which compresses the gas required for the high-pressure gas lamps lighting the exterior of Euston Market.

### INTERIOR LIGHTING.

As every employer of labour knows, a worker suffering from eyestrain or from headache due to eyestrain is only half a worker, and the amount of work he can turn out is accordingly lessened, apart from which the question of the worker's general welfare has to be considered. With high-pressure gas lighting properly distributed the workers are more cheerful, there is less likelihood of accident, supervision is easier, there is less spoiled work and the output is increased.

When considering interior lighting, each class of work, or each operation carried out in the building to be lighted, should be carefully studied. While in some classes of trade 1½ to 2 foot-candles might be adequate illumination on a working plane three feet above the floor, in others foot-candle readings very much higher would be called for. But actual measurement in candle-power is by no means everything. Evenness of illumination is often of vital importance; again, in some instances, it may be necessary to specify small local lighting units for individual workers in addition to general illumination by larger units. Whatever the requirements, however, if high-pressure gas is chosen as the lighting medium then there is no necessity to stint the amount of illumination, as the light can be provided at so comparatively low a cost.

### STREET LIGHTING.

For the lighting of main thoroughfares high-pressure gas lamps are ideal. To appreciate this, one has only to walk (or, better still, to drive a car) through some of London's best-known thoroughfares and neighbourhoods—Victoria Street, Parliament Square, Whitehall, Trafalgar Square, Regent Street, and Pall Mall, to mention just a few examples. Among the many towns and cities in the provinces where high-pressure gas is in use for public lighting, the following may be specially mentioned: Airdrie, Stourbridge, Bradford, Blackburn, Nelson, Salford, Burnley, Newcastle-on-Tyne, Middlesbrough and Manchester. In the last-named city there are many installations, and some particularly fine examples of this system of lighting are to be seen in London Road, Downing Street, Ardwick Green, Jackson Street (Hulme), and Alexandra Road.

Where gas undertakings lay down these high-pressure gas mains for street-lighting purposes they can advantageously be utilized for the lighting of individual shops, parades of shops, public markets, factories, workshops and other buildings on the line of route.

The fact that in most of the large towns high-pressure gas lighting is so much in evidence for illuminating public thoroughfares, railway stations, carriage and wagon works, sidings, and retail shops, and that thousands of large installations are in use by the best-known firms in the engineering, textile, printing, laundry and other trades, is proof that up-to-date local authorities, keen business men and progressive shopkeepers, recognize the economy and efficiency of the system.

## International Gas Exhibition at Antwerp

We understand that it has been decided to organize an International Gas Exhibition, to be held in Antwerp in May, 1926, for the purpose of illustrating the varied applications of gas. The Exhibition will be under the auspices of the Imperial Continental Gas Association, and further particulars may be obtained on application to the Secretary's Office (58 Meir, Antwerp).

# The Light of Other Days

IN a lecture delivered at the Wandsworth Technical Institute on December 3rd Mr. J. Darch gave an interesting account of lighting methods of the past, illustrated by numerous lantern slides. The outstanding fact of past history was the slow, lingering progress of the efforts of our predecessors to produce a satisfactory artificial light. "Not all the wisdom of Egypt, the philosophy of Greece, the engineering capacity of Rome, or the ingenuity of the European Renaissance were able to achieve so much of real progress in lighting as we moderns accomplished in the first few years of the 19th century."

Mr. Darch remarked that the time when man's curiosity and courage first enabled him to investigate the phenomena of fire was certainly not less than 35,000 years ago. It probably happened in Europe during the Glacial Age. One of the earliest methods was by twirling a pointed stick in a hole in dry wood—a process shown on the screen, and leading to the hearth fire. Next came the process of transferring the light by carrying a brand plucked from the hearth. Resinous pine wood suggests itself; but where this did not exist the oily bodies of sea birds were used. This led ultimately to the use of animal fat and fish oils in empty shells or hollow stones, the most primitive form of lamp, with grass or moss as the wick. (In Scotland the shell lamp has been seen in use up to 100 years ago, and was known as "Roaring buckie.")

Where shells were not available saucers of clay were devised. All such lamps were dirty and ineffective, for the table or floor was left in shadow. As late as the 5th century Herodotus found that in Egypt bowls filled with oil and fitted with floating wicks were still used. The next step was the pinching in of the soft clay to form a spout to take the wick, which enabled more light to emerge outwards and downwards; then later we find the spout closed in to prevent the flame creeping back, and the rim turned in to prevent the oil spilling; later still, trays to carry the lamps and retain dripping oil. Ultimately a handle was provided, and we thus arrive at the standard lamp employed in civilized countries for a period of 1,000 years, B.C. 400 to A.D. 600. All lamps found in Greece, Rome and Europe are of the circular form; those in Syria, Egypt and the East are elongated. Terra-cotta lamps have been found in rubbish heaps in thousands, but most of the ornamental ones in good state of preservation have been taken from the tombs.

All the oils used, whether derived from olives (as in the East) or from fish or animals, were thick and viscid and would not rise in the wicks; consequently the flame had to be kept down to the level of the oil. At the best they gave but a poor flickering light, always accompanied by a foul and stifling smell and a sooty smoke. The wick had to be constantly trimmed, for which purposes metal picks or tweezers were used. It was the custom to keep one lamp always alight for the purpose of avoiding the laborious effort to create a flame.

At a later stage lamps were embellished with ornament, and Mr. Darch showed many pictures of these with pleasing designs. The oldest bronze lamp known was found in Cyprus, and is probably 4,000 years old. This lamp is now in the British Museum. Many Roman lamps of bronze were also illustrated, some of elegant design. Silver and golden lamps were used in the temples. All these were hand-lamps, but stands were designed on which they could rest, varying in height from 6 inches to 6 feet. There was also the "rota" or wheel on which lamps could be placed and suspended.

In spite of all this the open wood fire for long held its own as an illuminant amongst the poorer classes. In Homer's "Odyssey," about 1,000 B.C., the use of three braziers in the Palace to give light is mentioned—a method made possible by the fact that roofs were commonly open in those days. Gilbert White, in his "History of Selborne" (150 years ago), remarks that the poorer classes in his day seldom used any artificial light except that from the ordinary fire. The resinous splinter also persisted until quite recent days, and in Scotland iron stands with clips ("peermen") were used for holding them, material being sold in bundles by vagrants to the cottagers. Yet another device was the cresset, a species of cage filled with old rope smeared with pitch. Old John Stow, who wrote in the 16th century, describes a festival where 2,000 men marched through the streets of London with 700 cressets, every cresset having two men to carry it, and another to bear a bag of materials from which it was replenished.

Candles were really the outcome of the prehistoric torch. They were first introduced by the Phœnicians about 1,000 years B.C., after which they became the regular indoor illuminant, and so remained for about five centuries. But about 400 B.C. candles in all the chief countries of Europe were displaced by the oil lamps of clay and bronze, and did not return to common use for nearly a thousand years.

Rushlights have been made in this country in the same way, century after century, down to 50 years ago. The necessary companion was the tinder box with its flint and steel. This was so uncertain in action that the wary housewife tried to avoid the trouble by keeping the wood ashes on the hearth alive until morning. The first friction match (the lucifer) was not invented until 1827, and a box of 50 cost half a crown. The introduction of the Swedish safety match dates to about 50 years ago.

Mr. Darch also illustrated many varieties of candlesticks, and showed an old print of the House of Commons so lighted, recalling its reluctance to install modern illuminants when they appeared. He also described the coming of the Argand lamp and the introduction of paraffin, a mineral oil with its advantage of rising in the wick, the application of stearine and paraffin wax to candles, and finally the coming of gas, illustrated by an old print showing the original lighting of Pall Mall. After their experience of gas lighting the public took the advent of electric lighting with comparative calm. With the progress in illuminants made within recent years, our need is now for skill in applying them; these developments Mr. Darch promised to deal with in a subsequent lecture on "Light, Lighting and Vision."

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# Recent Developments in Shop Lighting

AMONG the many changes that have taken place of recent years few have been so noticeable as the attitude of the shopkeeper towards illumination. Only a very few years ago artificial lighting was regarded as a necessary evil, to be borne grudgingly, and kept rigorously in check. Even the advent of the metal filament vacuum lamp had little effect upon this outlook. It was welcomed chiefly on account of its reduced consumption of electrical energy. As a means of stimulating business it was hardly considered. Then came the gasfilled lamp with its high intrinsic brilliance. At first this, too, fell into the old groove, until the waste and inconvenience of its "glare" became so apparent that something had to be done to improve the methods of its employment. Thenceforward as much attention was paid to the control of light as to its production, and by degrees fittings were designed to enable the new light source to be employed to the best advantage.

One of the most pressing needs was the elimination of "glare" from shop windows. The solution to this problem was soon discovered to lie in the elementary truth that things are seen by the light they reflect, and it at once became obvious that directional lighting was of the first importance. There was no need to see the light source itself, but every need to direct its light on to the display. Thence followed the various types of shop-window reflectors. These could be placed along the top of the window and hidden by a curtain, so that they in no way detracted the attention from the goods exhibited. At the same time they were so designed that practically the whole of the light emitted by the lamp they contained was directed downwards on to the exhibits. "Glare" was eliminated and the window made more attractive.

As a necessary consequence shopkeepers grew more interested in the possibilities of lighting, and encouraged

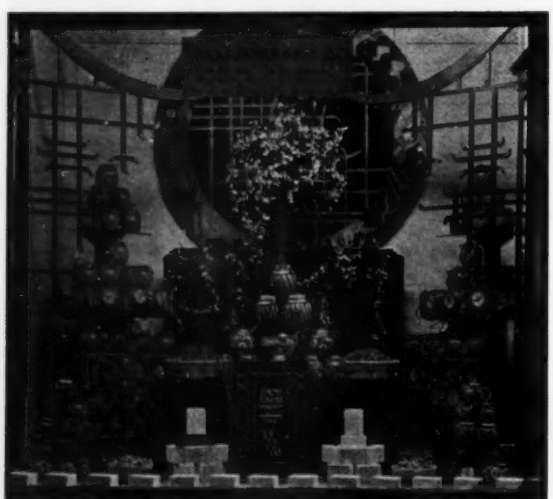

FIG. 2.—A modern window. No lighting apparatus is visible, yet the whole window is well and evenly lighted.

the engineer to continue his good work. Higher intensities of light were next attempted, and the pecuniary advantages of this were soon realized. Since the lamps were hidden, no "glare" could exist, so that it was now possible to raise the wattage and increase the illumination of the window. Instead of being repelled by naked lamps, the public were attracted by good illumination, while the shopkeeper received value for every penny he spent on light, instead of wasting two-thirds of it on the pavement outside.

Having thus benefited by the work of the illuminating engineer, he was now far more willing to listen to other schemes whereby his shop window might be made more attractive.

The value of colour was next demonstrated, and the demand for colour screens and coloured lamps is now well established. Spotlights and window flood-lights were realized to be of great assistance in emphasizing special commodities, while flashing-signs, illuminated fascias, and other lighting devices are to-day being installed in ever-increasing quantities.

Thus, in the course of little more than five years, a

FIG. 1.—An example of shop interior lighting by means of totally-enclosed diffusing units.

complete change has taken place in the attitude of leading shopkeepers towards artificial light. No longer is it regarded as an evil, but as an ally, and one whose resources are endless.

Meanwhile equal improvements have been taking place inside the shop. Here the problem was different from that presented by the window. Apart from such expensive devices as false skylights, there was no way of concealing the light source, while at the same time it was imperative to get rid of glare. As long as this objectionable factor remained, high-intensity lighting was out of the question, not merely because of the waste of light in an upward direction, but also because it would have been unbearable to both the employees and customers. To overcome this difficulty the lamp was enclosed in a unit made of diffusing glass. By this means the "glare" was eliminated, and higher intensities might be employed with impunity. The gloomy interior became transformed by this new type of equipment. A cheerful atmosphere prevailed and invited customers to wander round the shop and inspect its contents.

Showcases were also made more attractive by raising their illumination to a level considerably higher than that of the shop itself. In special cases, where a careful examination of fine work was desirable, local lights were introduced over the counter.

That the shopkeeper has greatly benefited by the change is a fact now beyond dispute. Under the new order of things, light becomes his obedient servant, and lifts his shop out of the rut into a place of prominence and attraction.

No other agent could have brought about such a change for so small a cost, and the illuminating engineer is to be congratulated on the rapid advance made during the past few years. He has made artificial light a most profitable necessary where once it was but a doubtful luxury—and this, by devising means whereby his medium is carefully controlled and made to perform its task in the most efficient manner.

# *THE MINE!*

***There is a Cryselco Lamp for every purpose under the moon—for instance :***

Cryselco Mill-type Lamps sales are higher than ever before. They have grown progressively year by year from the commencement of their manufacture.
These lamps have withstood the shock of competition as successfully as they withstand the shock and "dither" inseparable from the positions they occupy in the mines.
They are a "safe" lamp to recommend and, therefore, a safe lamp to stock. In fact, none better.
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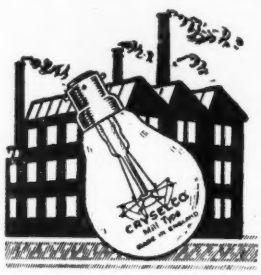


*We also supply FREE, Catalogues, Brochures and Price Lists, overprinted with the name of the Retailer; also cut-outs. Full Particulars of CRYSELCO LAMPS of all types and for all purposes will be willingly forwarded on application to—*

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BIRMINGHAM, 21/22, Newspaper House, 164, Corporation Street (Telephone, Central 3741).
GLASGOW, 23, Douglas Street (Telegrams, "Starter, Glasgow"; Telephone, Central 1253).
LONDON, Thanet House, 231/2, Strand, W.C.2 (Telegrams, "Cryselco Estrand London"; Telephone, Central 3016/7/8).
NEWCASTLE-ON-TYNE,, 27, Grey Street (Telegrams "Cryselco, Newcastle-on-Tyne"; Telephone, Central 1286).
LEEDS, 11, New Station Street (Telegrams, "Cryselco, Leeds"; Telephone, 27866 Leeds).
MANCHESTER, Douglas Chambers, 63, Corporation Street (Telephone, City 9120).
CARDIFF, 30, Charles Street (Telephone, Cardiff 7466).

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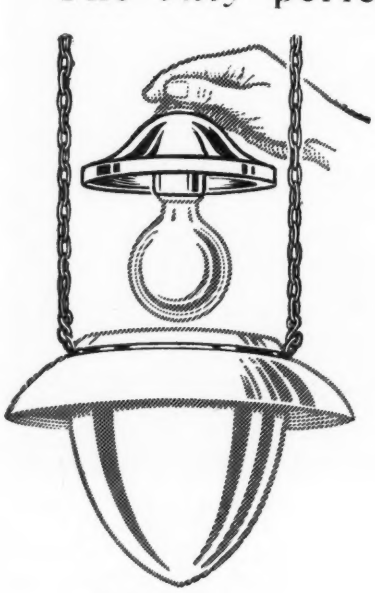
# "HOLDRITE"

The *only* perfectly safe method of suspending



## ONE PIECE GLASS LIGHTING UNITS

*No Screws in Actual Contact with Glassware*

PATENT No. 9106.
*Ask for List P* 1060.
*Samples sent to bona-fide trade enquirers.*

**FALK, STADELMANN & Co.**
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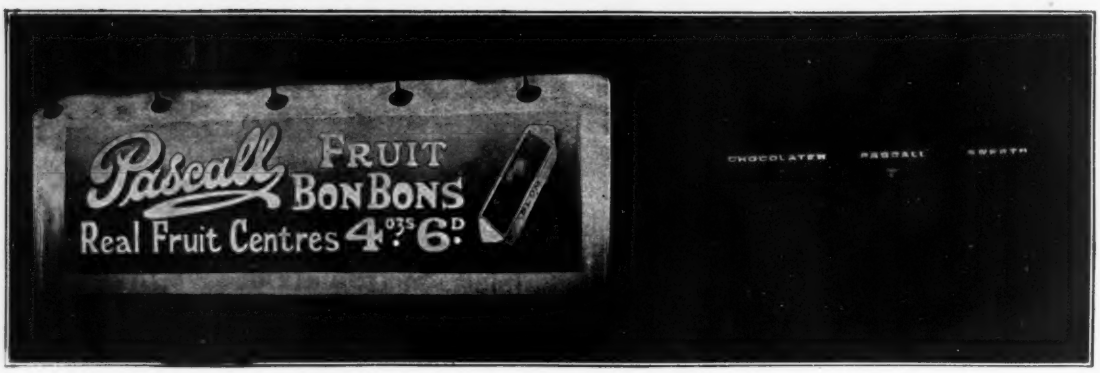
# TRADE NOTES & ANNOUNCEMENTS

AN INTERESTING POSTER-SIGN.

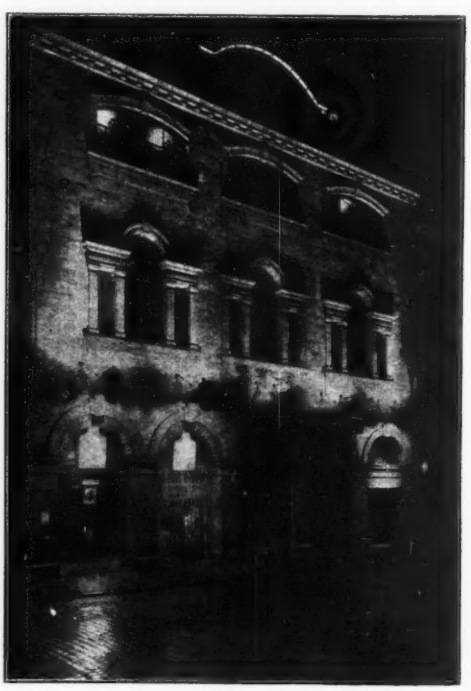



The above illustration of a striking illuminated poster occurs in a recent issue of "The Benjamin Reflector." This hoarding is 25 ft. by 8 ft., and is illuminated by five Benjamin Elliptical Angle Reflectors, spaced 4 ft. apart, and each using a 150-watt lamp. The illumination on the sign is about 25-30 foot-candles, and it forms a conspicuous object from the railway adjacent to this factory. In the distance will also be seen another illuminated sign, mounted along the length of the factory itself.

This issue also contains particulars of Bencolit units, and an illustration showing a comparison between the light yielded by the Benjamin colour-matching unit and average daylight.

## THE IMPERIAL CINEMA, BELFAST.—ANOTHER FLOOD-LIGHTING INSTALLATION.

It is evident that flood-lighting continues to grow in favour, and the number of such installations is constantly increasing. An interesting and effective system of flood-lighting has recently been carried out at the Imperial Cinema, Belfast. The attractive illumination over the front of this cinema, illustrated herewith, is produced by a number of double and single G.E.C. projectors, equipped with 500-watt and 200-watt projector-type Osram lamps; the 500-watt lamps are fitted in the projectors, which flood the upper part of the building with light, and the 200-watt lamps are accommodated in the projectors used for flood-lighting the lower part of the building. Single projectors are provided over the shop front, as it was not desirable to flood the windows below, which were equipped with interior illumination. Gilded hand-beaten leaves screen the projectors from view, materially enhancing the appearance in the day time.



Flood-lighting of the Imperial Cinema, Belfast.

## THE PROTECTION OF BRITISH GAS MANTLES.

The Report of the Safeguarding of Industries Committee, now available, contains a suggestion that will no doubt be welcomed by makers of incandescent mantles in this country, namely, that a flat-rate duty not exceeding 6s. per gross (equivalent to ¼d. per mantle) should be imposed. One of the chief considerations that has evidently guided them in making this proposal is evidently the desirability of encouraging the manufacture of thoria and ceria, used in the preparation of mantles. The consequences of the withdrawal of foreign supplies of these materials were brought home during the war, and it is only natural to exercise forethought in trying to prevent a similar shortage in the future.

The report contains some interesting statistical data. Apparently the total sales of mantles for consumption in this country amounted to approximately 60 millions in 1924. Of these roughly 60 per cent. were home-manufactured and the remainder imported. In 1920, on the other hand, British manufacturers produced 83·4 of the total mantles sold, and the number of persons employed was much greater—3,238, as compared with 1,707 in 1924. This illustrates the degree to which the competition of foreign products has affected home manufacture.

## SHIP'S LIFEBOAT LAUNCHING FLOOD-LIGHTS.

Ship's lifeboat launching flood-lights forms the subject of a leaflet received from the General Electric Co. Ltd. There are designs for use where it is proposed to mount flood-lights fore and aft in a ship and to project the light towards the centre of the ship, and for working cargo over the side. They are designed to be mounted at intervals along the side of a ship and project the light down the ship's side and on to the water. In design and finish they are fully up to the usual G.E.C. standard.

## A PAISLEY STREET-LIGHTING INSTALLATION.

Upwards of 400 G.E.C. " Paisley "-type street lamp posts, complete with lantern and G.E.C. " Superlux " globes, have been installed by the Paisley Corporation for the lighting of secondary streets and roads.

At the base of the " Paisley " lamp post is a hinged door, with space to fix fuses, and, where necessary, instal an automatic time switch.

The " Superlux " globe is 16 in. in diameter, and is suitably ventilated for use with one 300-watt Osram gasfilled lamp. In the installation at Paisley two 100-watt Osram gasfilled lamps have been fitted in each lantern.

The Paisley Electricity Department has been fully justified in its adoption of the G.E.C. units, in that the resultant illumination is highly pleasing and free from glare, yet of sufficient intensity for side-street lighting, and the installation does great credit to Mr. W. Blair Smith, the Paisley Corporation Engineer.

At the recently held electrical exhibition in Paisley two of the G.E.C. " Paisley " street-lighting units were prominent features. This unit is particularly suitable for residential districts, and combines efficiency with ornamental design. It will be particularly useful for seaside gardens and the like, as it is practically all cast iron.

The general appearance of this street-lighting unit is shown in the accompanying illustration. Diffusing globes are not yet very widely applied for public lighting in this country, and their adoption in this case is a good feature.

## THE NEW OSRAM LAMP CATALOGUE.

The new and revised issue of the Osram G.E.C. Lamp catalogue is an excellently-got-up production, the cover being in dark and light blue, whilst every page has a decorative border in similar colours. One admires, also, the ingenious illustration showing the Osram Lamp Works at Brook Green, standing out from the adjacent mass of buildings. In the introduction attention is drawn to the method of specialized manufacture whereby the factory is divided into unit sections, each devoted to the making of a small range of standardized types, and with highly beneficial results. There is a little talk on " Osram Service " and its value to the electrical industry and a brief account of the Research Laboratory at Wembley and the Lemington Glass Works. The illustrations of the various lamps (daylight lamps, colour-sprayed lamps, etc.) are beautifully done, and show clearly what a wide range is now available. One feature not generally known, perhaps, is the colour caps and hoods intended for use in the case of signs where it is desirable that the filaments should be visible.

We have also to acknowledge the receipt of a list describing the Magnet Wiring System, and a cheerful-looking booklet (" The Electrical Christmas Gift ") describing seasonable novelties, and containing particulars of three alternative " Magnet " Electrical Christmas Gift Windows—the latter an enterprising departure.

## METRO-VICK SUPPLIES, LTD., ELECTRIC FITTINGS CATALOGUE.

This catalogue is executed on dignified and impressive lines, and contains upwards of 200 pages, many varieties of modern fittings being shown. As a frontispiece, the view of the William and Mary Room at the Company's London Showrooms makes an attractive picture, and the illustrations throughout are excellently printed by the photogravure process. As is to be expected, semi-indirect and totally enclosed diffusing glassware is well illustrated, but there are also many designs of brackets, silk shades, ornamental lanterns and cut-glass chandeliers, so that all tastes are catered for.

## PARKER, WINDER & A. CHURCH LTD. (BIRMINGHAM).

Under the heading of " Electric Service," practically everything necessary for an electric light installation is shown. The initial part of the catalogue deals with lighting plants. We have next switches, fuses, and all manner of wiring accessories, and finally a representative range of fittings and electrical heaters, wireless apparatus, etc.

## THE SIEMENS MONTHLY LIST.

We have often commented on the timely arrival of the Siemens Monthly List, with its comprehensive data on lamps, fittings, etc. The latest issue, as usual, contains much condensed information. Its regular arrival should be very useful to consulting engineers and others who need to know where to lay their hand on an up-to-date price list at short notice.

## E.D.A. NATIONAL ADVERTISING CAMPAIGN.

A booklet issued by the British Electrical Development Association describes the main features of their publicity campaign for 1925-26, amongst which " co-operative advertising " takes a prominent place. All firms and undertakings engaged in any branch of the British electrical industry are invited to communicate with the headquarters of the Association at 15, Savoy Street, Strand, London, W.C.2.

## A VISIT TO MESSRS. FALK. STADELMANN & CO.'S SHOWROOMS.

During a recent visit to Messrs. Falk, Stadelmann & Co.'s showrooms we had an opportunity of seeing something of the wide variety of fittings displayed. It may be recalled that this firm deals alike with gas, electric and oil lamps and fittings. There is an imposing show of diffusing glassware for semi-indirect lighting, but the taste of those who still prefer the old cut-glass chandeliers or fittings of " period " design, etc., are also catered for. Messrs. Falk, Stadelmann & Co. make something of a speciality of silk shades, and many pleasing beaded varieties were on view. It was particularly interesting to see, side by side, shades of the old tinted-glass type and the much better designs of painted diffusing-glassware that are now taking their place. Of course, there are people who still cling to the obsolete types, which are apparently cheap, and therefore firms must stock them; but it was encouraging to hear that the demand for these things is continually decreasing, whereas the modern types are rapidly replacing them in popular favour; so that the disappearance of these relics is only a matter of time. Another feature is the " Holdrite " suspension method, illustrated in our last number, which is to be seen applied to many different forms of fittings.

## THE PHOTECTOR CO. LTD.—CHANGE OF ADDRESS.

We understand that the Photector Co. Ltd. are moving from their present address in Palmer Street, Westminster, to more commodious premises, where there will be ample accommodation both for offices and stores. On and after January 1st, 1926, the new address will be: 711-715, Fulham Road, London.

## CONTRACTS CLOSED.

The following contracts are announced:

GENERAL ELECTRIC CO. LTD.

*Post Office;* tender to the G.P.O. for 60,000 telephone switchboard lamps, 40-volt No. 2, accepted.

SIEMENS AND ENGLISH ELECTRIC LAMP CO. LTD.

*Great Western Railway;* acceptance of tender for gasfilled lamps, all wattages.


### WATTAGE CONSUMED BY DIMMERS.

Sir,—At the Society's meeting on Thursday last, to which you were good enough to invite me, a point was raised in connection with the wattage consumed by a dimmer used in conjunction with an electric lamp. Fearing that I must be under some misapprehension as to the exact nature of this device, I hesitated to join in the discussion, which was left in a somewhat undecided state.

Surely, if a dimmer is merely a resistance placed in series with the lamp, there is no antagonism whatever between Ohm's Law and the statement that the use of a dimmer reduces the wattage consumption. To take a simple concrete case, if the added resistance equals the resistance of the lamp, the current, according to Ohm's Law, is halved. The total voltage remains the same, and hence the total wattage consumed is also halved.

There seemed to be an impression that Ohm's Law, if properly applied, would show that the wattage saved on the lamp was exactly balanced by that expended in heating the resistance, and it may therefore be instructive to consider the wattage consumed by the two individual components in the above example. As before, by inserting the dimmer, the current throughout the circuit is halved. Also the voltage drop across the lamp only is now reduced to one half its former value. Hence the wattage consumed by the lamp, being the product of amperage and voltage, is reduced to one quarter. This amount is also taken by the resistance, and the total wattage is again shown to be reduced to one half. In fact, the wattage, like the current, is inversely proportional to the total resistance in the circuit, as can readily be seen by multiplying by E both sides of the well-known equation, $C = \frac{E}{R}$, which is the most usual expression of Ohm's Law.

These are, of course, somewhat elementary matters, but I thought it worth while to make this communication, as some confusion on this point appears to exist.

Yours faithfully,

S. H. GROOM.

[We think there can be no doubt that any method of "dimming" an electric lamp by introducing resistance in the circuit, must result in less current being taken from the mains, and hence a reduction in the wattage consumed. When it is asserted that there is no "saving" what is usually meant is that the diminution in light is much greater than the reduction in current, so that the apparatus becomes less efficient than before. Dimming by resistance insertion may, however, often be convenient in practice.—ED.]

# INDEX (December, 1925).

*See page II of cover.*

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